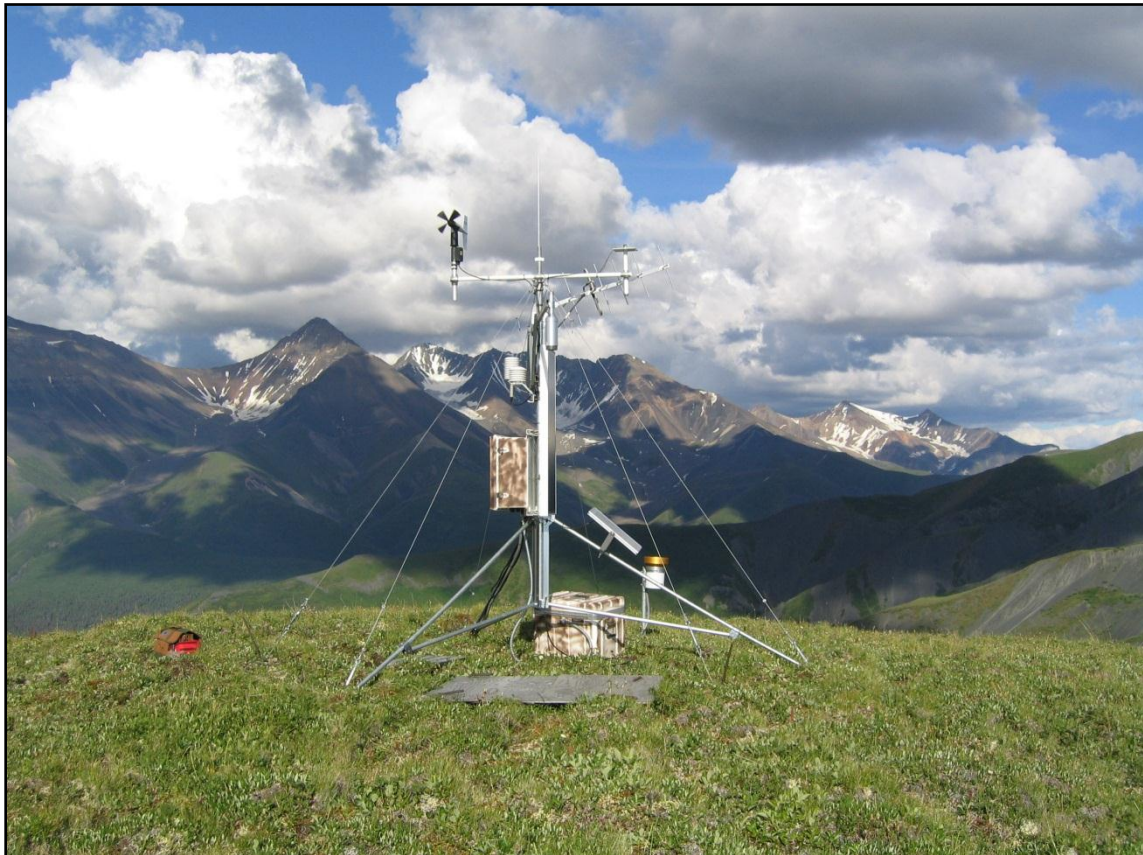




# Annual Climate Summary 2008

## *Central Alaska Network*

Natural Resource Data Series NPS/CAKN/NRDS—2012/245



**ON THE COVER**

**Chititu climate station in Wrangell – St. Elias National Park and Preserve**

Photograph by: NPS Photo by Pam Sousanes

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# Annual Climate Summary 2008

## *Central Alaska Network*

Natural Resource Data Series NPS/CAKN/NRDS—2012/245

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U.S. Department of the Interior  
National Park Service  
Natural Resource Stewardship and Science  
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from the Central Alaska Network website (<http://www.nature.nps.gov/im/units/CAKN>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/NRPM>).

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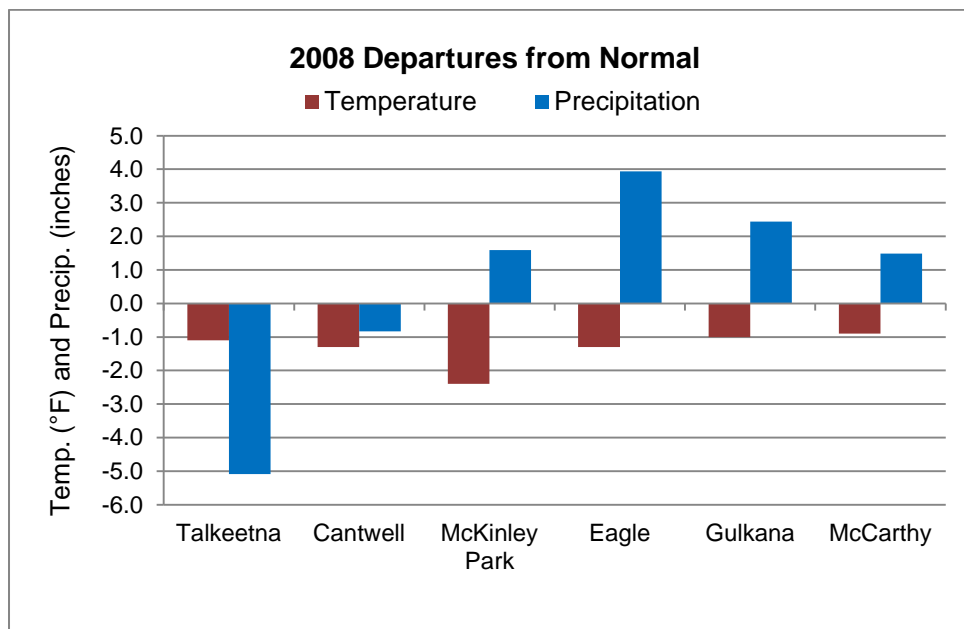
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## Executive Summary

Using methodologies developed for the Central Alaska Network (CAKN), climate was monitored at existing National Weather Service stations and new CAKN climate stations in and around Denali National Park and Preserve, Wrangell -St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve. Annual temperatures across the state of Alaska during 2008 averaged approximately 0.7°F below normal, in the CAKN the annual temperatures averaged 1.7°F below normal. Winter temperatures in 2008 were below average. Spring temperatures were near normal, with warmer anomalies in March, but moderating to near normal conditions in April and May. Summer temperatures were 2.0 °F cooler than average, and fall was 1.0°F cooler than the 1971-2000 average. In 2008, climate in the region reflected near normal conditions for both temperature and precipitation, however there was substantial variability within the seasons. The annual precipitation totals for most of the sites in CAKN were near normal, but it was variable throughout much of the area with periods of excessive rainfall in August and October south of the Alaska Range and below normal annual snowfall totals throughout most of the region.





## Introduction

Denali National Park and Preserve, Wrangell–St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve make up the Central Alaska Inventory and Monitoring Network (CAKN), covering over 21 million acres. Climate is considered to be the most important broad-scale factor influencing ecosystems. Because global climate models indicate that climate change and variability will be greatest at high latitudes, climate monitoring will be critical to understanding the changing conditions of park ecosystems.

The CAKN climate monitoring program deployed sixteen new climate stations between 2003 and 2005, mostly at higher elevations, to capture elevational and latitudinal climate gradients within the parks, and to capture data in areas where there were no baseline references. The monitoring protocols, which included the site selection process, were completed in 2004 (Sousanes 2004). The analyses for this annual report are based on the long-term National Weather Service cooperative sites in and around the CAKN parks that have been in operation for 24 to 82 years. The new sites are analyzed for comparison, but long-term trends will take time to develop. This is the fourth in a series of reports for the Central Alaska Network Climate Monitoring Program.

### Central Alaska Network Climate Characterization

The central Alaska climate can be characterized by the three major climate regimes that span from the southern boundaries of the network along the coast to the interior. The southern coast of Wrangell-St. Elias is significantly affected by the Gulf of Alaska. The Pacific Ocean moderates the temperature along the coast in both summer and winter, and brings a considerable amount of precipitation to the coastal areas and the southern flanks of the mountain ranges, including the Chugach and St. Elias Ranges that ring the Gulf Coast. Just north of these mountain ranges the precipitation tapers off and seasonal temperatures are more extreme. The winters are cold and the summers can get hot. The CAKN areas farthest north, and the farthest from the coast, are true interior climates characterized by low annual precipitation and large seasonal variation in temperature.

The climate of Alaska is affected by solar radiation, atmospheric gases (volcanic eruptions, CO<sub>2</sub>), the water temperature of the Pacific Ocean, and ocean currents. These large scale processes drive changes in atmospheric patterns, like the repositioning of the polar jet stream and the Aleutian low pressure system or the frequency of La Nina's and El Nino's (Papineau, 2003). Each of these can affect the regional patterns of storm tracks, prevailing winds, snowfall amounts, and the extent of sea ice (ACIA, 2004).

There are several large-scale climate patterns and indices that are of particular interest to Alaska, including the Pacific Decadal Oscillation (PDO) which is an index of sea surface temperatures in the North Pacific Ocean. Typical winter sea surface temperatures during the warm phase of the PDO are warmer off of the Gulf Coast of Alaska moderating air temperatures over Alaska (Hartmann and Wendler, 2005; Keen 2008). The PDO seems to cycle through a warm and cool phase every 20 -30 years. Temperature trends that have shown climatic warming tend to be strongly biased by a sudden shift in 1976 from the cooler regime to a warmer regime (Figure 1).

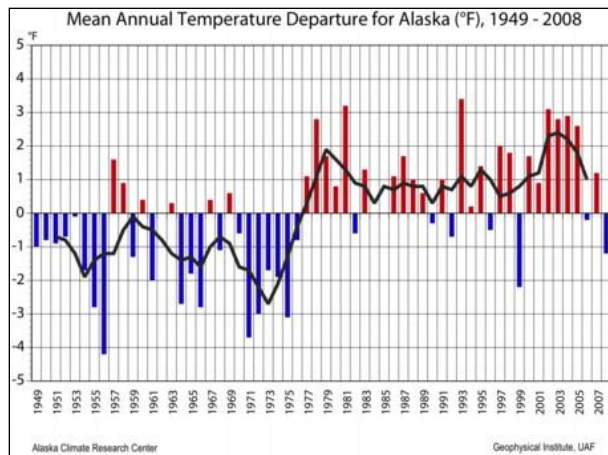


Figure 1. Mean annual temperature departures for Alaska showing the shift to a warmer regime in 1976 that correlates with the PDO. Graph courtesy of the Arctic Climate Research Center, retrieved from <http://climate.gi.alaska.edu/ClimTrends/Change/TempChange.html>.

While the north Pacific seems to explain some of the temperature trends in the region, the Arctic Ocean, and in particular the extent of sea ice will likely influence both temperature and precipitation patterns in Alaska. In recent years there has been a continued significant reduction in the extent of the summer sea ice cover and the decrease in the amount of relatively older, thicker ice (NSIDC, 2009). Models have predicted that the retreating sea ice should affect the temperature and ecosystems of adjacent lands. An increase in the amount of energy absorbed by vegetation and its transfer to the atmosphere, will contribute to the further high-latitude amplification of climate warming (Chapin et al., 2005).

## Methods

Data were compiled from seven long-term climate stations with the most complete records nearest the three CAKN parks that represent the major climate regimes in the network (Table 1). These stations have long enough records to compare 2008 data with the latest normal period, 1971-2000. For these sites temperature, precipitation, and snowfall are analyzed. The monthly means are simple arithmetic averages computed by summing the monthly values for the period 1971-2000 and dividing by thirty. Prior to averaging, the data are adjusted if necessary to compensate for data quality issues, station moves or changes in station reporting practices. Missing months are replaced by estimates based on neighboring stations.

Five additional sites are analyzed to try and capture winter temperature inversions and climate deviations at higher elevations (Table 2). Monthly means and annual totals were compiled for the newer CAKN stations including, temperature, wind, relative humidity, solar radiation, snow depth, and summer rainfall (Figure 2). Most of the summaries, analysis, charts, and graphs from NOAA and NRCS are in standard units; in order to standardize units throughout the report data are presented in standard units. Period of record averages for the long-term sites are available in Appendix A, and extremes and records for these sites are listed in Appendix B.

Table 1. Long-term sites used in CAKN analysis.

<b>Name</b>	<b>Lat</b>	<b>Long</b>	<b>Elev. (ft)</b>	<b>Network</b>	<b>Start</b>	<b>End</b>	<b>Park</b>
Eagle	64.7666	-141.2000	850	COOP	1949	Present	YUCH
McKinley Park	63.7195	-148.9656	2060	COOP	1925	Present	DENA
Cantwell	63.4000	-148.9000	2150	COOP	1983	Present	DENA
Talkeetna	62.1800	-150.0600	350	COOP	1949	Present	DENA
McCarthy	61.4166	-143.0000	1250	COOP	1984	Present	WRST
Gulkana	62.1502	-145.4500	1580	SAO	1949	Present	WRST
Yakutat	59.5000	-139.6700	30	SAO	1936	Present	WRST

Table 2. Paired high and low elevation sites used for CAKN analysis.

<b>Name</b>	<b>Lat</b>	<b>Long</b>	<b>Elev (ft)</b>	<b>Network</b>	<b>Start</b>	<b>End</b>	<b>Park</b>
Stampede	63.7478	-150.3281	1800	CAKN RAWS	2003	Present	DENA
Toklat	63.5255	-150.0465	2920	CAKN RAWS	2005	Present	DENA
Eielson Visitor Center	63.4307	-150.3102	3730	CAKN RAWS	2005	Present	DENA
Wonder Lake	63.4900	-150.8800	2119	RAWS	1995	Present	DENA
Dunkle Hills	63.2670	-149.5415	2651	CAKN RAWS	2003	Present	DENA
Coal Creek	65.3041	-143.1570	820	CAKN RAWS	2004	Present	YUCH
Upper Charley	64.5169	-143.2023	3654	CAKN RAWS	2005	Present	YUCH
Chicken Creek	62.1240	-141.8473	5260	CAKN RAWS	2004	Present	WRST
Chisana	62.0775	-142.0500	3320	RAWS	1988	Present	WRST
Chititu	61.2735	-142.6209	4554	CAKN RAWS	2004	Present	WRST
May Creek	61.3208	-142.5844	1650	CAKN RAWS	1990	Present	WRST
Gates Glacier	61.6029	-143.0132	4060	CAKN RAWS	2005	Present	WRST
Klawasi	62.1469	-144.9269	3100	RAWS	1991	Present	WRST
Tebay	61.1810	-144.3392	1880	CAKN RAWS	2005	Present	WRST
Tana Knob	60.9080	-142.9013	3739	CAKN RAWS	2005	Present	WRST

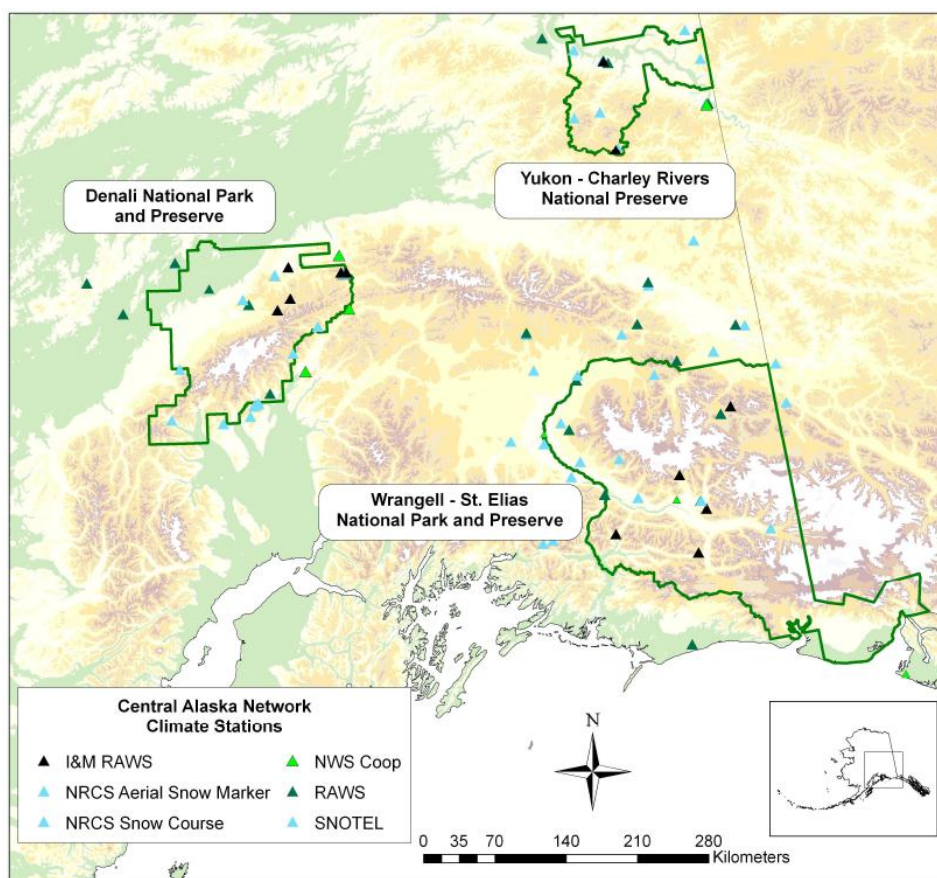


Figure 2. Map of CAKN climate station locations.



## Results

### Climate Year 2008 Synopsis

The climate in CAKN for 2008 was cooler and wetter than recent years. The mean annual temperatures at the longer-term sites averaged 1.7 degrees F colder than normal. Temperatures were variable across the network, especially during the winter months, but the negative departure from normal for most months stands out. Cantwell, south of Denali Park headquarters, had the coldest July on record. Annual precipitation totals were above normal for the interior sites mostly due to some late spring snowfalls in April and excessive rainfall in July. Both Eagle and Gulkana had the wettest July on record, while sites south of the Alaska and Chugach Mountain Ranges were below normal for the year (Figure 3).

The contiguous U.S. experienced a nationally averaged temperature of 53.0° F, which was the coolest in more than ten years, but at 0.2° F above the 20th century (1901-2000) mean it was near normal (NOAA 2009). Annual temperatures across the state of Alaska during 2008 averaged approximately 0.7°F below normal (Figure 4). Winter temperatures in 2007-2008 were near average. Spring was the 29th warmest on record with a temperature 1.0°F above average, summer was 1.0 °F cooler than average, and fall was more than 2.0°F cooler than the 1971-2000 average (Figure 5).

The snowpack for the 2007-2008 varied across the state, from record high snowfalls on the Seward Peninsula and in Southeast Region, to near record lows for the western interior locations. The first persistent snows for the central Alaska interior fell during the first week of October. Snow courses in the northern areas of Wrangell St. Elias, Yukon-Charley and the eastern portions of Denali had snowpacks that were 50% of normal for most of the season. Some late season storms came through in April and deposited 20% of the annual snowfall in the central interior. These storms originated in the Bering Sea and did not reach the western interior locations or the Copper River Basin. Record breaking temperatures across Alaska during the last week in April quickly depleted the snowpack for the season. Figure 6 shows the statewide snowfall development from March through May (NOAA 2009). Cool and wet conditions, especially in July kept wild fires across the state to a minimum.

The El Nino/Southern Oscillation (ENSO) began 2008 in as a La Nina (cold phase) which developed during the fall of 2007. It peaked in February and began to dissipate and by June 2008, the ENSO transitioned to a neutral phase. Neutral conditions remained at the end of the year, with below-average sea surface temperatures (NOAA 2009). The PDO index for 2008 was negative (cooler sea surface temperatures) for the entire year, with the strongest negative departures during the summer months (JISAO 2009) (Figure 7).

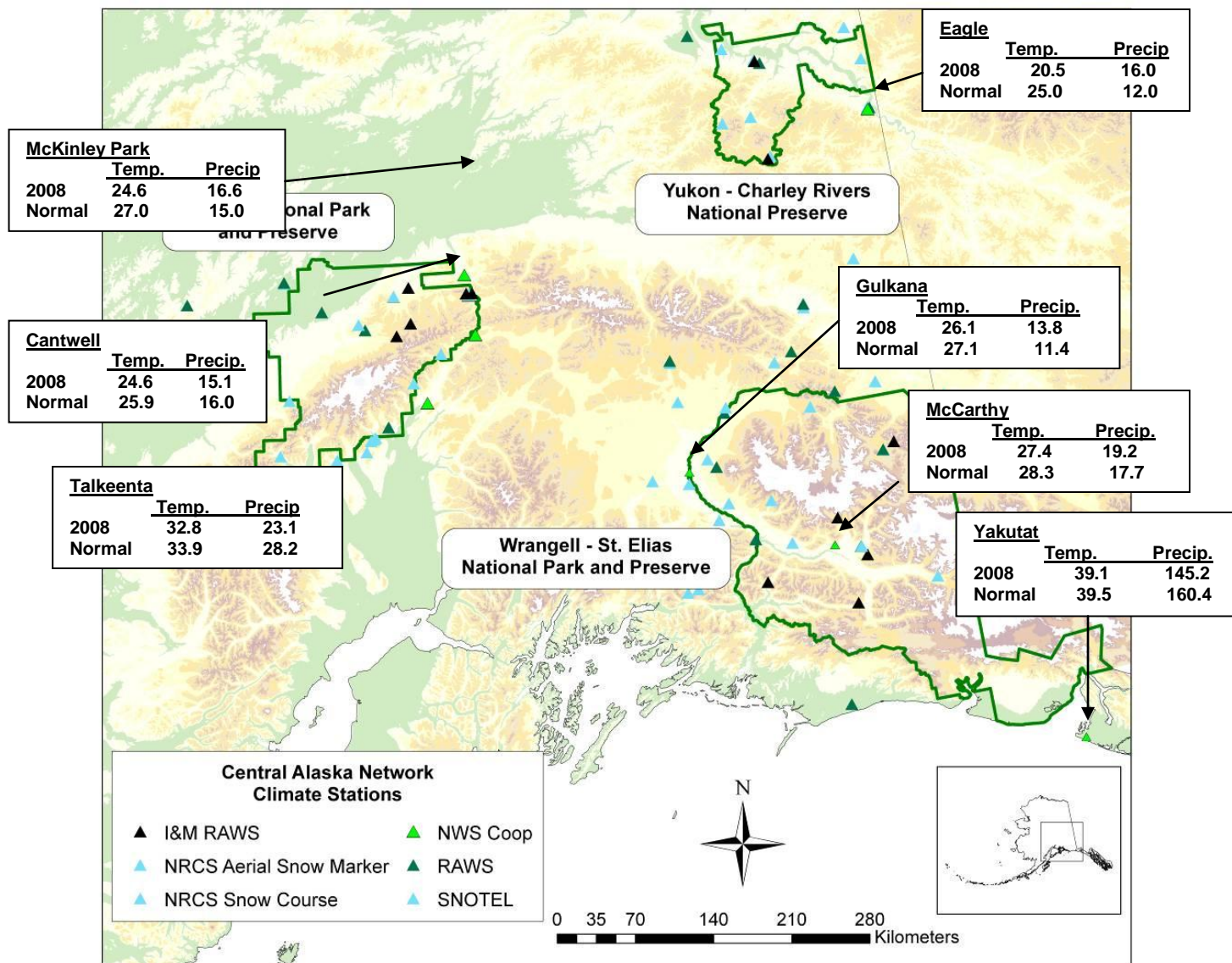


Figure 3. Mean annual temperature and precipitation totals for long-term sites in CAKN for 2008 compared with 1971-2000 normals.

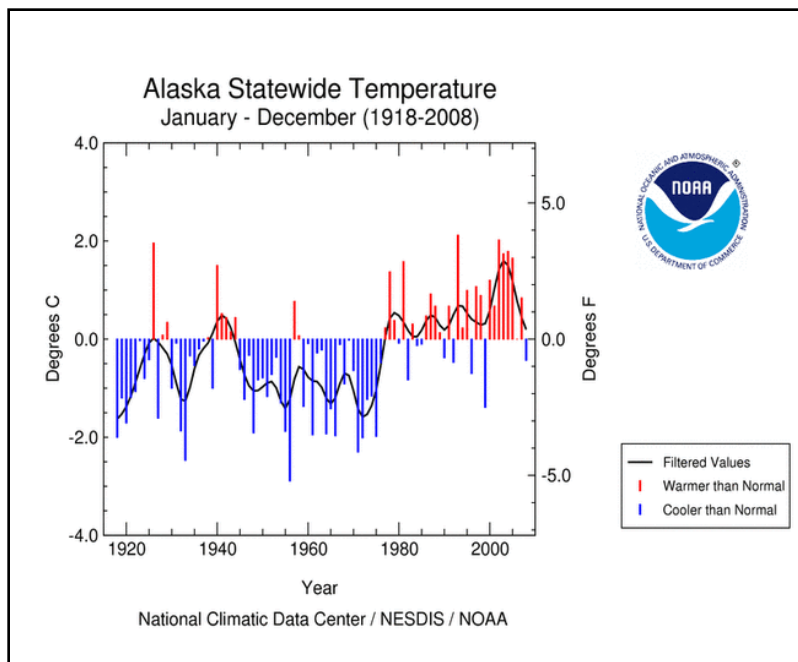


Figure 4. Average temperatures across Alaska were 0.7 ° F below the 1971-2000 mean (NOAA 2009).

Figure retrieved from

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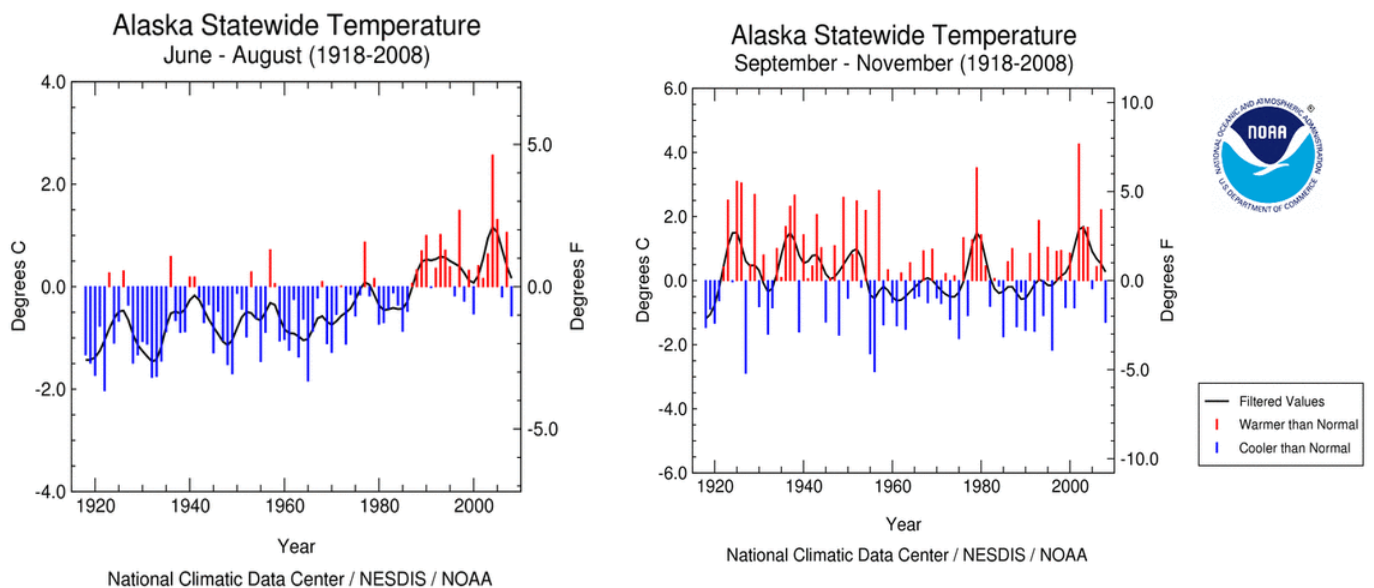
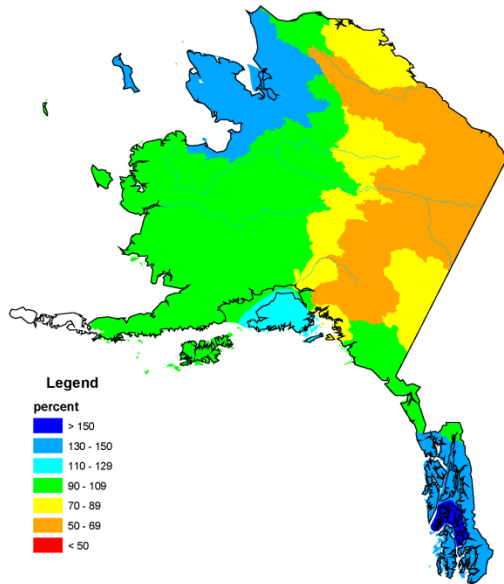


Figure 5. Seasonal statewide temperatures 2008 – departure from normal. Figures retrieved from

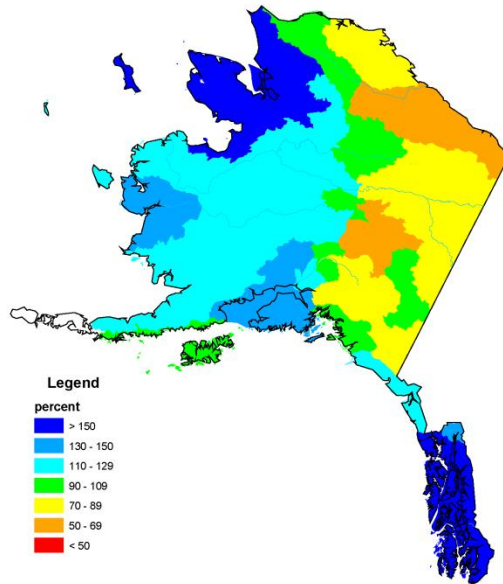
[http://www.ncdc.noaa.gov/img/climate/research/2008/nov/alaska\\_Elemta\\_09112008\\_pg.gif](http://www.ncdc.noaa.gov/img/climate/research/2008/nov/alaska_Elemta_09112008_pg.gif).

Alaska Snowpack  
as of March 1, 2008



Prepared by  
USDA, Natural Resources Conservation Service  
National Water and Climate Center  
Portland, Oregon  
<http://www.wcc.nrcs.usda.gov>

Alaska Snowpack  
as of May 1, 2008



Prepared by  
USDA, Natural Resources Conservation Service  
National Water and Climate Center  
Portland, Oregon  
<http://www.wcc.nrcs.usda.gov>

Figure 6. March 1 and May 1 snowpack depths for Alaska 2008 (NRCS 2009).

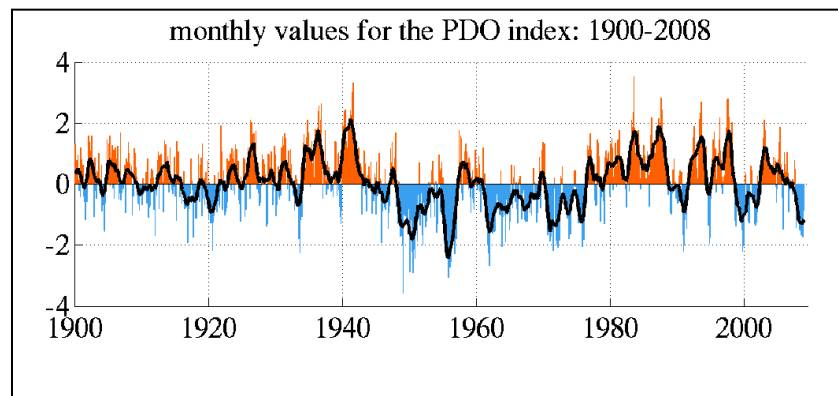


Figure 7. Pacific Decadal Oscillation index. Note the negative departure for 2008. Graph retrieved on January 23, 2008 from <http://jisao.washington.edu/pdo/> (JISAO 2009).

## Temperature

Data records for temperature have been collected at seven locations around the CAKN since 1949. The mean annual temperatures around the CAKN region in 2008 averaged 1.2 °F below the 1971-2000 normal for all of the sites (Figure 8). Once again, winter temperatures were more variable than the summer temperature departures (Table 3). March and November had the strongest positive temperature departure for most of the sites, with temperatures between 1 and

5° F warmer than normal. The July negative departure was most noticeable ranging from -2.6 to -3.9° F colder than normal at the interior sites and just over 0.5 degrees cooler along the coast near Yakutat (Figure 9). McCarthy and Cantwell had record cold average temperatures for July. See Appendix A for ‘period of record’ data for the long-term sites and Appendix B for individual site records and extremes.

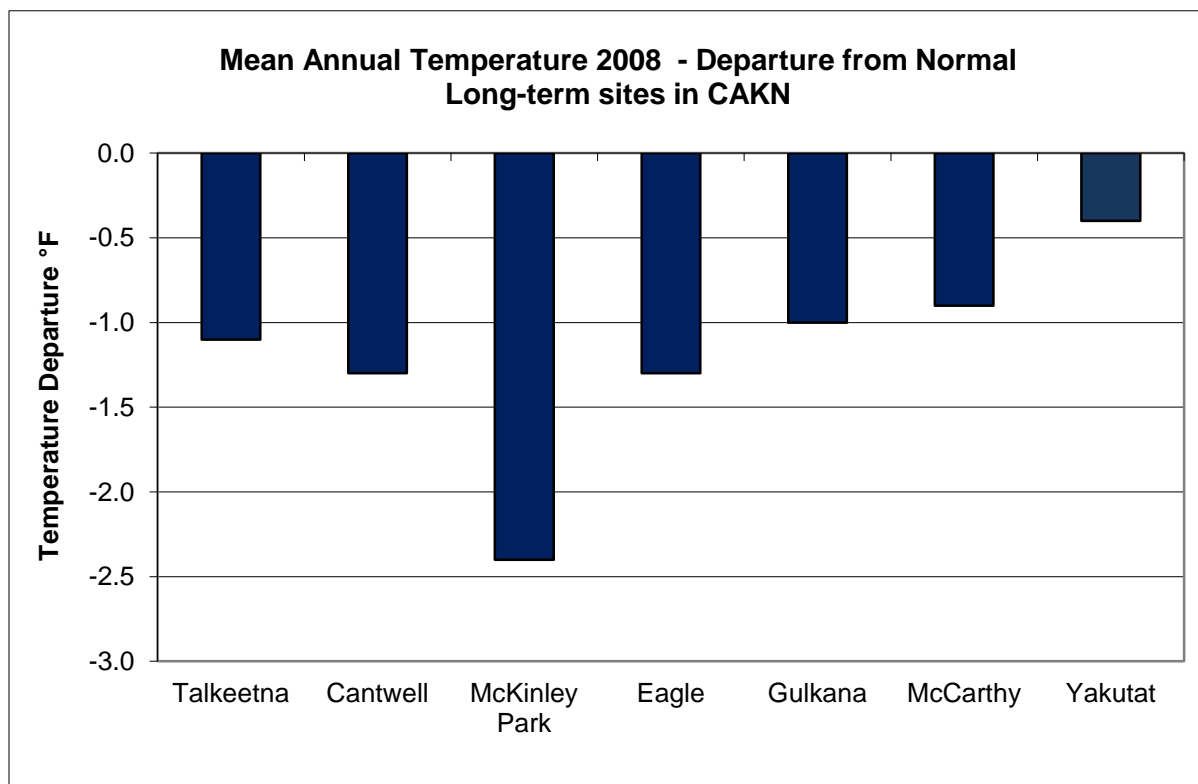


Figure 8. 2008 Mean annual temperature departure from normal at long-term CAKN sites.

Table 3. 2008 departure from normal (1971-2000) for long-term sites in CAKN.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Talkeetna	-5.0	-0.3	4.9	-2.1	-0.1	-1.4	-2.6	-0.7	1.3	-4.9	1.0	-3.8	<b>-1.1</b>
Cantwell	-1.7	-1.3	3.2	-1.4	-0.3	-0.8	-2.8	-0.5	1.6	-6.3	0.9	-6.2	<b>-1.3</b>
McKinley Park	-4.4	-1.6	2.1	-2.1	-0.7	-2.0	-3.9	-2.3	0.6	-8.5	-2.5	-4.5	<b>-2.4</b>
Eagle	1.2	-2.0	-1.4	3.3	1.9	1.4	-3.2	-4.8	-0.4	-6.9	4.2	-8.4	<b>-1.3</b>
Gulkana	-2.1	-2.4	4.7	1.2	0.9	-0.4	-3.0	-1.7	1.2	-4.9	1.9	-7.0	<b>-1.0</b>
McCarthy	-1.8	-2.6	3.7	0.9	0.8	0.6	-2.9	-0.6	1.5	-4.1	0.1	-6.5	<b>-0.9</b>
Yakutat	-1.1	-0.1	1.1	-0.9	-0.1	-1.3	-0.6	0.0	1.3	-1.1	2.5	-4.1	<b>-0.4</b>

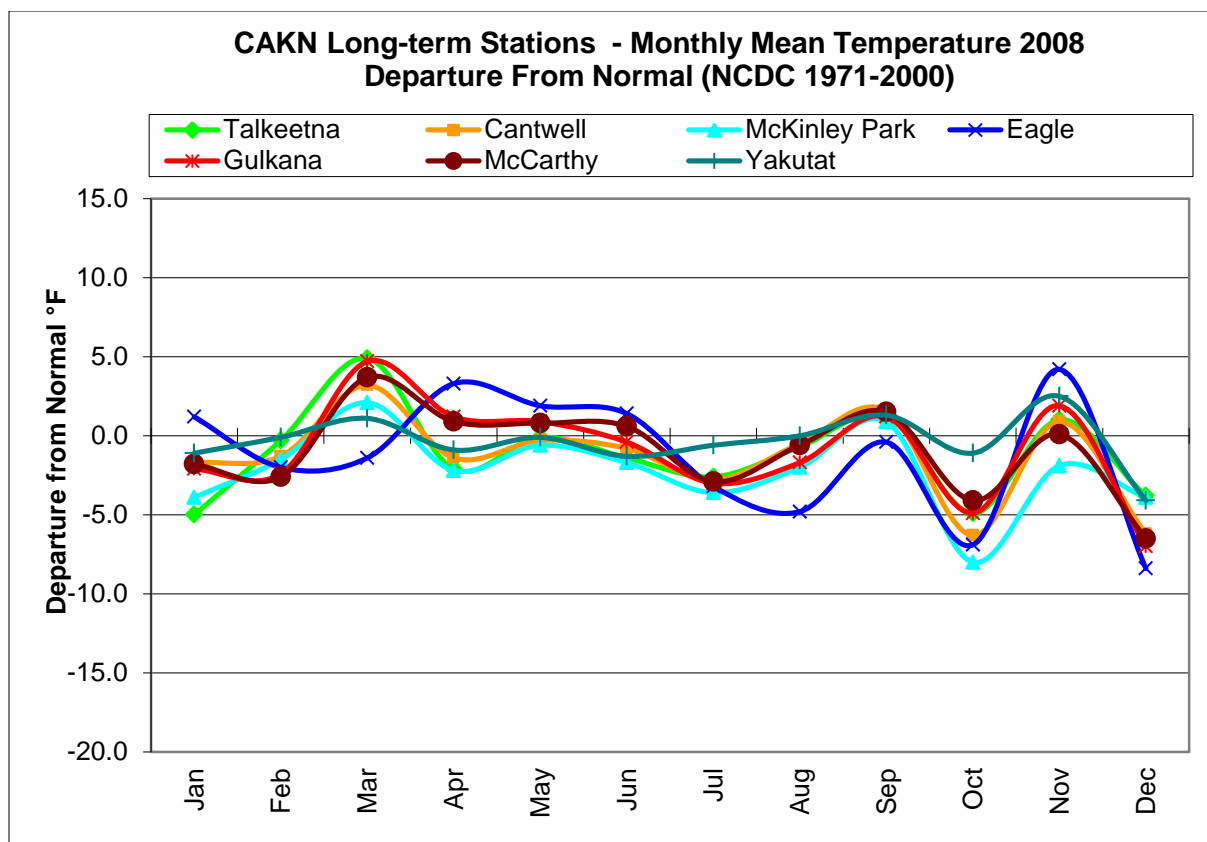


Figure 9. CAKN 2008 mean monthly temperatures departure from normal at long-term sites.

The year started off cold with temperatures below normal for the first half of the month. A wide temperature swing mid-month sent maximum daily temperatures above freezing for a few days, but the month ended up colder than normal for all sites except for Eagle. February was colder than normal at all sites; there were more than 6 consecutive days in mid month when the temperature remained at 30-50° F below zero for the interior sites. A temperature of -67° F was recorded at O'Brien Creek near the Canadian border, south of YUCH. In early March there was a stretch of warm weather where temperatures approached record highs, but starting on St. Patrick's Day, the average daily temperatures dropped below normal and stayed below normal for the next few weeks. April was cool and snowy for the most part, but on April 22-24<sup>th</sup> record warm temperatures were recorded at most of the long-term sites.

The summer of 2008 was cool and wet in the interior with average temperatures at all sites for July and August below normal. There was a bit of a warming trend in September, but dropped back down below normal for October, with temperatures ranging between 4 and 8 degrees F colder than normal. Typical winter temperature variability was the norm for the rest of the winter with temperatures in November above normal and December temperatures dropping below normal. The temperatures plummeted the last week of December and remained in the -20 to -40 °F range for another two weeks – this cold snap affected most of the state. Table 4 gives the monthly means for the long term sites compared to the latest climate normal period from 1971-2000.



Table 4. Mean monthly and annual temperatures for 2008 from long-term sites compared with 1971-2000 normal period.

# of years	Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
58	<b>Talkeetna</b>													
	2008	6.0	15.1	27.5	32.2	45.7	53.9	56.3	54.9	47.5	26.5	18.5	9.2	<b>32.8</b>
	1971-2000 normal	11.0	15.4	22.6	34.3	45.8	55.3	58.9	55.6	46.2	31.4	17.5	13.0	<b>33.9</b>
25	<b>Cantwell</b>													
	2008	-1.9	2.9	15.8	24.6	39.7	49.8	51.9	49.6	41.8	16.4	8.7	-3.6	<b>24.6</b>
	1971-2000 normal	-0.2	4.2	12.6	26.0	40.0	50.6	54.7	50.1	40.2	22.7	7.8	2.6	<b>25.9</b>
84	<b>McKinley Park</b>													
	2008	-2.1	2.9	15.2	25.1	41.3	50.2	51.7	48.6	41.1	14	6.6	0.4	<b>24.6</b>
	1971-2000 normal	2.3	4.5	13.1	27.2	42.0	52.2	55.6	50.9	40.5	22.5	9.1	4.9	<b>27.0</b>
53	<b>Eagle</b>						*							
	2008	-10.4	-8.1	6.4	32.1	47.9	49.8	57.6	50.0	42.4	16.4	6.4	-15.2	<b>20.5</b>
	1971-2000 normal	-11.6	-6.1	7.8	28.8	46.0	57.5	60.8	54.8	42.8	23.3	2.2	-6.8	<b>25.0</b>
58	<b>Gulkana</b>													
	2008	-6.8	0.8	20.0	32.3	44.8	52.7	54.0	51.4	44.3	21.5	7.4	-8.6	<b>26.1</b>
	1971-2000 normal	-4.7	3.2	15.3	31.1	43.9	53.1	57.0	53.1	43.1	26.4	5.5	-1.6	<b>27.1</b>
23	<b>McCarthy</b>	**	**									**	**	
	2008	-4.2	3.4	21.7	34.1	44.8	52.6	53.0	51.6	44.8	24.2	7.3	-4.9	<b>27.4</b>
	1971-2000 normal	-2.4	6.0	18.0	33.2	44.0	52.0	55.9	52.2	43.3	28.3	7.2	1.6	<b>28.3</b>
60	<b>Yakutat</b>													
	2008	24.7	28.3	32.6	36.3	43.5	48.4	53.0	53.3	49.5	40.0	34.9	24.5	<b>39.1</b>
	1971-2000 normal	25.8	28.4	31.5	37.2	43.6	49.7	53.6	53.3	48.2	41.1	32.4	28.6	<b>39.5</b>

\*Missing month from NWS COOP. Used the mean monthly data from Mission Creek Snotel in Eagle

\*\*Missing month. Used May Creek RAWs data

Yellow – YUCH, Green – DENA, Blue – WRST

### New CAKN Sites

Although the new CAKN climate stations and other Remote Automated Weather Stations (RAWs) around the CAKN parks do not have long records, the monthly and annual averages and totals fill in some of the large spatial gaps in the network and offer information on the differences in climate at higher elevations. Table 5 lists the monthly and annual temperatures for these sites grouped by park and Figure 10 shows them graphically. The monthly average temperatures are warmer for the lower elevation interior sites during the summer months, while the winter monthly average temperatures are warmer at higher elevations, effectively smoothing the annual averages. See Appendix C for complete monthly summaries from the CAKN climate sites.

Table 5. Monthly mean temperatures from CAKN stations 2008.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Stampede	-5.6	-3.7	10.6	25.7	41.9	50.6	52.3	46.9	39.3	12.8	0.2	-4.4	22.2
Toklat	0.9	2.3	14.0	22.6	38.7	47.1	49.1	45.0	38.7	14.2	8.0	6.3	23.9
Eielson VC	6.8	9.7	17.4	21.8	37.1	45.0	47.1	44.8	39.0	18.5	13.7	15.5	26.4
Wonder Lake	-3.1	-0.2	11.7	24.4	41.4	50.4	52.2	47.8	38.2	12.3	1.2	3.4	23.3
Dunkle Hills	4.3	5.8	15.7	22.3	36.1	45.5	47.6	46.2	39.1	17.6	12.8	6.7	25.0
Denali VC	-5.2	-0.5	15.5	27.1	43.8	53.2	53.8	49.0	41.3	13.1	3.3	-6.1	24.0
Coal Creek	-16.1	-9.2	6.7	31.4	48.1	57.0	56.1	48.7	41.0	11.6	0.0	-17.9	21.4
Upper Charley	-10.1	-2.6	8.5	25.2	39.7	48.4	48.1	43.3	37.7	13.2	7.1	-4.5	21.2
Chicken Creek	6.9	5.1	15.3	24.8	34.7	41.6	43.4	41.2	35.7	18.5	13.8	6.7	24.0
Creek Chisana	-12.5	-5.9	12.9	28.6	42.2	50.0	50.6	47.0	38.4	13.5	-1.2	-12.1	21.0
Chititu	11.2	11.1	19.3	28.1	36.3	42.0	43.1	42.2	38.0	21.9	18.7	9.4	26.8
May Creek	-4.2	3.3	22.2	34.4	46.3	52.6	53.3	50.7	44.5	-0.7	7.3	-6.0	25.3
Gates Glacier	13.2	11.2	20.1	25.9	36.5	42.3	43.7	43.0	37.3	22.1	19.8	11.6	27.2
Klawasi	4.2	5.9	20.9	29.5	41.4	48.4	49.9	47.9	41.6	22.1	14.9	2.6	27.4
Tebay	4.1	9.4	19.0	29.6	39.6	45.9	49.2	47.2*	37.6	25.5	15.9	2.5	25.3

\*Missing data from July -nearby stations were consistently @ 2 degrees colder than corresponding July temps - used this to estimate Tebay July mean temp.

Yellow – YUCH, Green – DENA, Blue – WRST

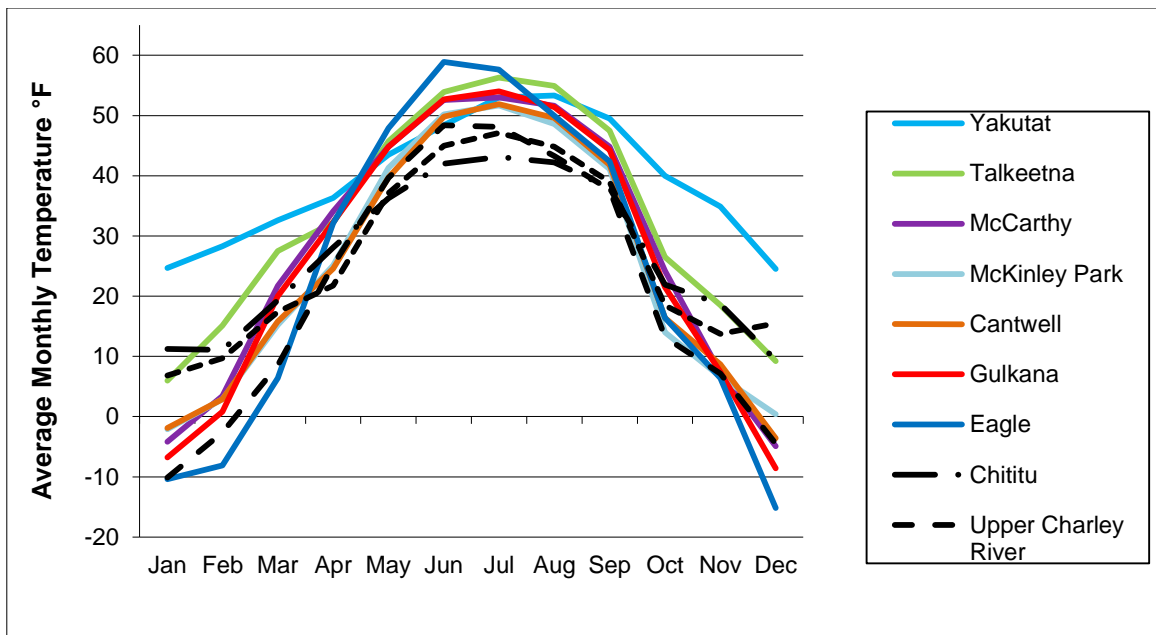


Figure 10. CAKN mean monthly temperatures for 2008.



One of the objectives of the CAKN climate program was to instrument higher elevation sites to acquire information related to temperature gradients in complex topography. In many cases higher sites were deployed in the vicinity of existing lower elevation sites for comparison. Correlations between the paired high and low elevation sites are best described by monthly means rather than annual means. In the summer, the higher sites tend to be 5 to 10° colder depending on the elevation (an increase in elevation lowers the temperature), but in the winter if the air is still and the temperature plummets, the cold air sinks into the valleys and a persistent inversion sets up and the higher elevations can be 10 to 20° F warmer than the surrounding lowlands. The air is often still in the darker winter months due to the lack of solar radiation that generates the surface winds that are so common in the summer. Of course, if a storm system moves in from the Gulf of Alaska or Bering Sea, warm ocean winds (known as Chinooks) often funnel through the mountain passes, raising temperatures and stirring up the air. The areas just north of these mountain passes often get winds in excess of 40 mph during these events.

The following tables show the monthly and annual variation between low and high elevation sites in the three CAKN parks. In 2008, all but one of the higher elevation sites that we compared had warmer mean annual temperatures than their corresponding low elevation site. Table 6 shows Chicken Creek and Chisana sites which are both located north of the Wrangell Mountain Range in WRST in the continental interior, north of two major mountain ranges. The annual temperature was 3.0 degrees warmer at Chicken Creek, the higher site. Table 6 also shows May Creek and Chititu which are both located in the Chitina River Valley between the Wrangell Mountain Range to the north and the Chugach Range to the south. The higher site was again 1.5 degrees warmer than the lower site, at both of these locations seasonal patterns dominated. The high sites were warmer in the winter and cooler in the summer, but the winter differences were more extreme, for example monthly mean summer temperatures were about 7 degrees warmer on average at Chisana compared to Chicken Creek the higher site, while Chicken Creek mean winter temperatures averaged about 16 degrees warmer than the lower elevation site at Chisana.

Table 6. Mean monthly temperatures for 2008 at high and low elevation paired sites in WRST.

Month	Chicken Creek Elev. - 5260'	Chisana* Elev. - 3320'		Chititu Elev. - 4554'	May Creek Elev. - 1650'
Jan	6.9	-12.5		11.2	-4.2
Feb	5.1	-5.9		11.1	3.3
Mar	15.3	12.9		19.3	22.2
Apr	24.8	28.6		28.1	34.4
May	34.7	42.2		36.3	46.3
Jun	41.6	50.0		42.0	52.6
Jul	43.4	50.6		43.1	53.3
Aug	41.2	47.0		42.2	50.7
Sep	35.7	38.4		38.0	44.5
Oct	18.5	13.5		21.9	-0.7
Nov	13.8	-1.2		18.7	7.3
Dec	6.7	-12.1		9.4	-6.0
Annual	24.0	21.0		26.8	25.3

Red is warmer temperatures and blue is colder temperatures.

\*Chisana is usually compared to Chicken Creek, but due to data gaps Nabesna was used for this report.

Table 7 shows the high and low elevation sites in YUCH. The variation at these two sites is not as extreme as sites farther south. The mean annual temperatures at the two sites were very

similar in 2008, with Coal Creek just 0.2°F warmer than Upper Charley. The Upper Charley site was warmer for each of the winter months, but the spread between the two sites was not as extreme as the WRST examples. If you looked only at mean annual temperatures these sites would appear to be very similar but a closer look at the monthly differences shows that they are quite different (Figure 11). In Denali, Eielson Visitor Center is located at a high elevation site just north of the crest of the Alaska Range. This site is compared with Stampede which is located farther north and east, where the topography starts to flatten out (Table 7). The mean annual temperature at Eielson was 4.2°F warmer than Stampede. The monthly average temperatures were warmer in January, February, March, October, November, and December, or 6 out of 12 months. This site is subject to the warm Chinook winds that come through the passes in the winter and is located above the inversion.

Table 7. Mean monthly temperatures for 2008 at high and low elevation paired sites in YUCH and DENA

<i>Month</i>	<i>Upper Charley</i> Elev. - 3654'	<i>Coal Creek</i> Elev. - 802'		<i>Eielson VC</i> Elev. - 3730'	<i>Stampede</i> Elev. - 1800'
Jan	-10.1	-16.1		6.8	-5.6
Feb	-2.6	-9.2		9.7	-3.7
Mar	8.5	6.7		17.4	10.6
Apr	25.2	31.4		21.8	25.7
May	39.7	48.1		37.1	41.9
Jun	48.4	57.0		45.0	50.6
Jul	48.1	56.1		47.1	52.3
Aug	43.3	48.7		44.8	46.9
Sep	37.7	41.0		39.0	39.3
Oct	13.2	11.6		18.5	12.8
Nov	7.1	0.0		13.7	0.2
Dec	-4.5	-17.9		15.5	-4.4
<b>Annual</b>	<b>21.2</b>	<b>21.4</b>		<b>26.4</b>	<b>22.2</b>

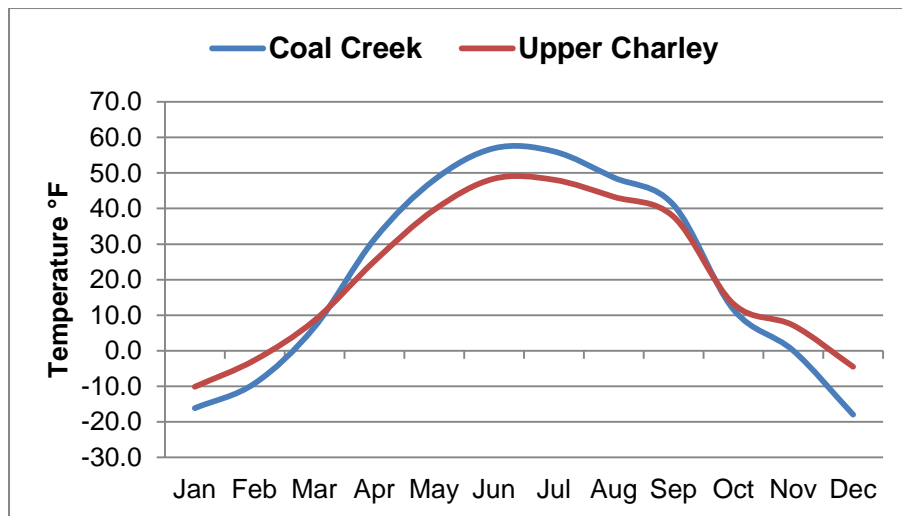


Figure 11. Temperature variation in YUCH - comparison of monthly mean temperatures.

## Precipitation

Annual precipitation totals throughout the network were above normal for most of the CAKN long-term sites in 2008, except for Talkeetna which had an annual total more than 5 inches below normal and Yakutat which was 15 inches less than normal (Table 8 and Figure 12). July was a wet month for most of the region; Eagle had an incredible 3.91 inches more than normal for July. In almost all cases the July totals are what pushed the annual totals above normal, for the most part every other month was near normal (Figure 13). Some late spring snow storms in the interior bumped April's totals above normal at all sites except for Yakutat (Table 9). The precipitation amounts for Yakutat are generally five times greater, on average, than the other sites in the network; because of this difference, Yakutat is not included in the figures due to scale issues. See Appendix B for records for all long-term sites.

Table 8. Annual precipitation totals - departure from normal 2008.

<i>Site</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Annual</i>
Talkeetna	0.28	-0.93	0.06	0.61	-1.05	-0.79	-0.30	-1.73	-0.80	0.72	-0.51	-0.65	<b>-5.09</b>
Cantwell	0.13	-0.02	0.04	0.40	-0.46	0.10	0.15	-0.26	-0.20	0.13	-0.10	-0.76	<b>-0.83</b>
McKinley Park	-0.15	0.41	-0.14	1.02	-0.42	-0.79	1.83	0.70	-0.70	-0.10	0.24	-0.31	<b>1.59</b>
Eagle	-0.05	-0.17	-0.16	0.07	-0.72	-0.08	3.91	-0.12	0.42	0.52	0.46	-0.14	<b>3.94</b>
Gulkana	0.20	-0.02	-0.22	0.81	-0.49	-0.32	2.30	-0.30	0.20	0.30	-0.19	0.17	<b>2.44</b>
McCarthy	-0.30	-0.17	0.11	0.27	-0.52	-0.31	2.10	1.87	-0.70	0.55	-0.82	-0.62	<b>1.49</b>
Yakutat	-5.74	0.89	-3.01	-1.50	-2.10	-1.69	6.59	-3.93	2.30	2.80	-2.61	-7.19	<b>-15.18</b>

Widespread rainfall amounts of 3-5 inches caused flooding in interior Alaska the last week of July. The heaviest precipitation fell on the north slopes of the Alaska Range from Nenana to Big Delta and in the Chena, Salcha and Goodpaster basins on the northern side of the Tanana River. Levels on the Tanana River at Fairbanks reached the second highest stage on record, with the highest being the 1967 flood. The Tanana River at Nenana reached the 3rd highest stage on record. Minor to moderate flooding occurred at a number of locations in the Fairbanks area and moderate flooding occurred in Nenana.

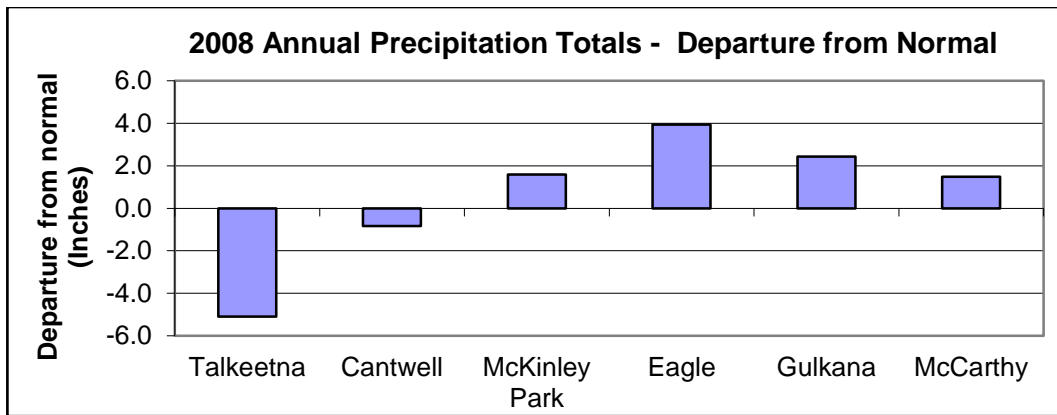


Figure 12. Annual precipitation totals departure from normal for long-term CAKN sites – 2008.

Table 9. Total monthly precipitation at long-term CAKN sites for 2008 compared with 1971-2000 normals

# of years	Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
59	<b>Talkeetna</b>													
	2008	1.73	0.35	1.32	1.83	0.59	1.62	2.92	2.8	3.57	3.78	1.27	1.31	23.09
	1971-2000 normal	1.45	1.28	1.26	1.22	1.64	2.41	3.24	4.53	4.35	3.06	1.78	1.96	28.18
25	<b>Cantwell</b>													
	2008	1.02	0.61	0.53	0.79	0.22	1.8	2.88	2.81	2.43	1.22	0.64	0.17	15.12
	1971-2000 normal	0.89	0.63	0.49	0.39	0.68	1.7	2.73	3.07	2.61	1.09	0.74	0.93	15.95
84	<b>McKinley Park</b>													
	2008	0.55	0.95	0.24	1.29	0.25	1.43	4.92	3.32	1.06	0.95	1.02	0.58	16.56
	1971-2000 normal	0.7	0.54	0.38	0.27	0.67	2.22	3.09	2.62	1.76	1.05	0.78	0.89	14.97
53	<b>Eagle</b>						*							
	2008	0.39	0.3	0.15	0.37	0.45	1.7	6.04	1.73	1.59	1.49	1.13	0.61	15.95
	1971-2000 normal	0.44	0.47	0.31	0.3	1.17	1.78	2.13	1.85	1.17	0.97	0.67	0.75	12.01
58	<b>Gulkana</b>													
	2008	0.65	0.5	0.14	1.03	0.1	1.22	4.12	1.5	1.64	1.32	0.48	1.14	13.84
	1971-2000 normal	0.45	0.52	0.36	0.22	0.59	1.54	1.82	1.8	1.44	1.02	0.67	0.97	11.4
23	<b>McCarthy</b>	**											**	
	2008	0.7	0.67	0.51	0.5	0.12	1.49	4.48	4.17	2.18	2.84	0.35	1.2	19.21
	1971-2000 normal	1	0.84	0.4	0.23	0.64	1.8	2.38	2.3	2.85	2.29	1.17	1.82	17.72
60	<b>Yakutat</b>													
	2008	7.44	11.88	8.4	9.31	7.68	5.48	14.47	9.34	23.18	26.8	12.56	8.66	145.2
	1971-2000 normal	13.2	11	11.4	10.8	9.78	7.17	7.88	13.3	20.9	24	15.2	15.9	160.4

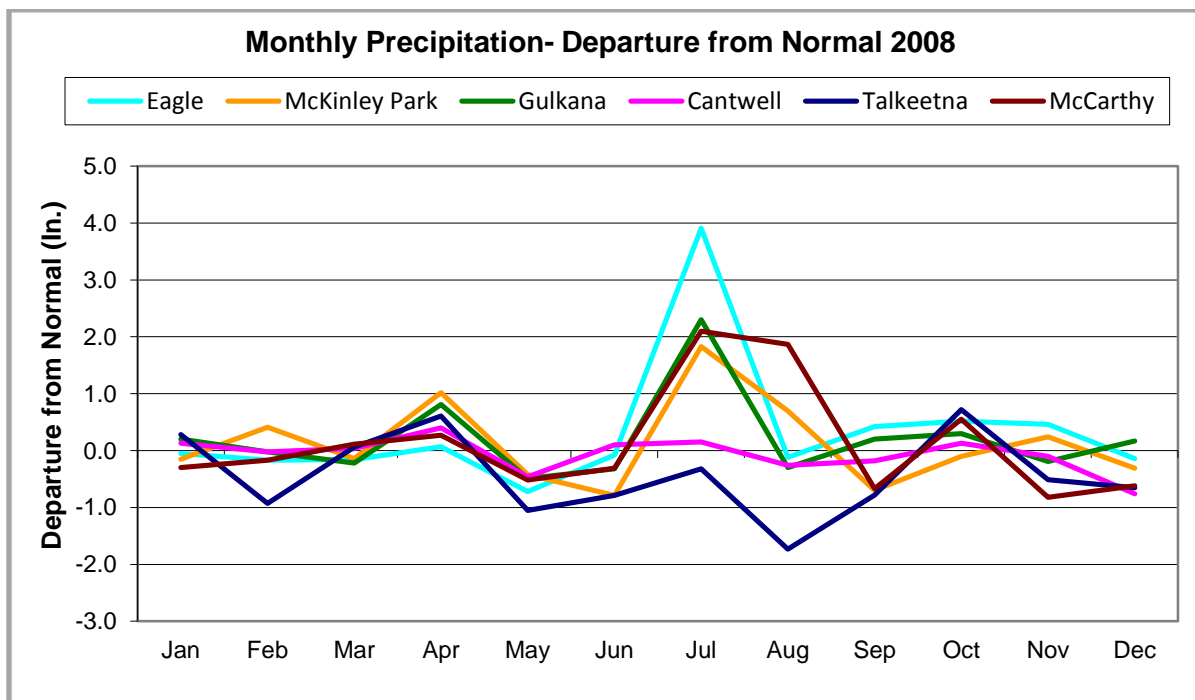


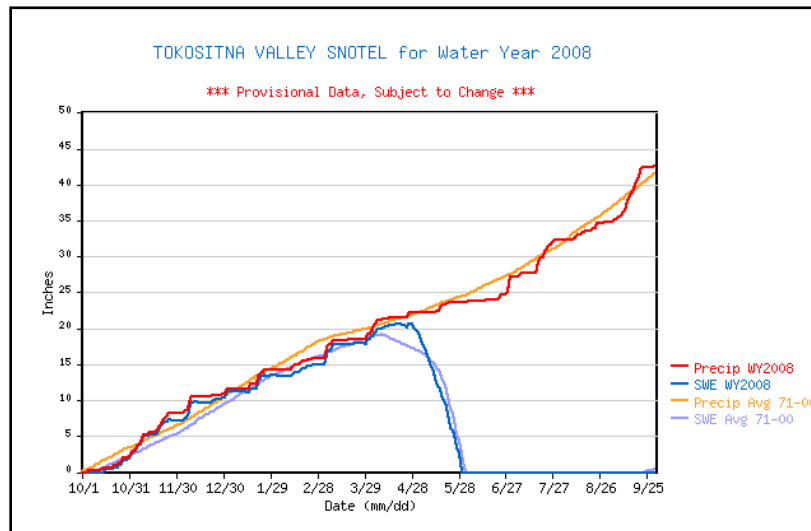
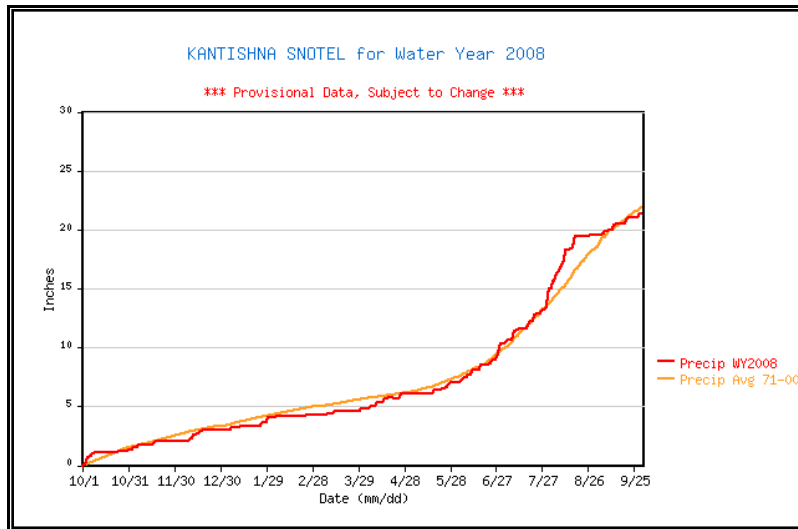
Figure 13. Monthly precipitation totals departure from normal for 2008.

Year round precipitation is recorded at the new snow telemetry (SNOTEL) sites deployed in Denali as part of the CAKN climate and snow programs. These new sites provide an accurate representation of winter snow water equivalent at remote sites. These sites, along with the snow courses and aerial markers, surveyed monthly throughout the winter season, are based on the ‘water year’ running from October 1 through September 30. An annual report summarizing the snow and precipitation data from snow courses, aerial markers, and SNOTEL sites around the network is produced in the late fall of each year (Sousanes 2008). The two new SNOTEL sites in Denali and an existing site near Eagle are briefly summarized in this report.

The Kantishna SNOTEL site, on the north side of the Alaska Range recorded 6.1 inches of total winter precipitation (snow water equivalent) from October 1, 2007 through May 1, 2008, or 29% of the total annual precipitation of 21.4 inches. The precipitation gage on the south side of the Alaska Range at Tokositna Valley recorded 22.2 inches of precipitation from October 1, 2007 through May 1, 2008, which is only 0.5 inches different than last year’s total and one tenth shy of the 1971-2000 normal. There was 42.6 inches total precipitation recorded for the year.

Mission Creek SNOTEL, near Eagle, had a total of 3.1 inches of precipitation between October 1, 2007 and May 1, 2008, the average is 6.0 inches, so the snow water equivalent was about 50 % of normal for the year. The mean annual total precipitation for this site is 13.6 inches and was 14.6 for 2008, an inch above normal, indicating that there was much more summer rainfall than normal. The new SNOTEL site at May Creek reported its first full year of precipitation, snow water equivalent, and cumulative precipitation. There was 6.8 inches of snow water equivalent on May 1<sup>st</sup>; the annual total precipitation was 18.3 inches, so the winter snowfall accounted for

37% of the total precipitation for the year. The snow off date was May 2, 2008; two days before this there had been 6 inches of snow on the ground, the record temperatures quickly melted the remaining snowpack. Cumulative precipitation graphs for the four SNOTEL sites are presented in Figure 14 (note the differences in scale).



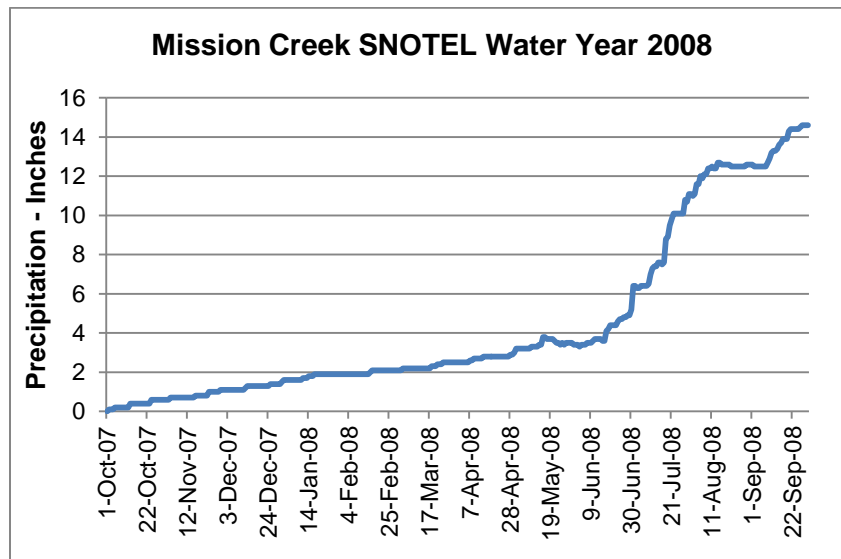
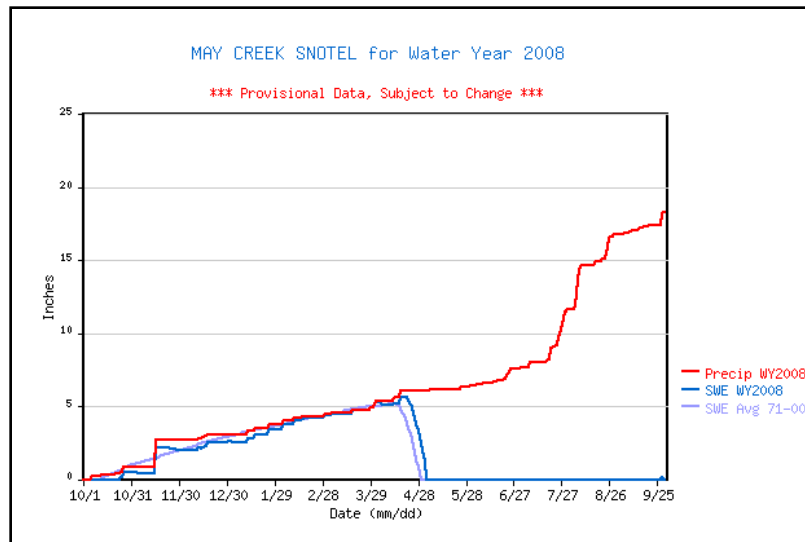


Figure 14. Cumulative precipitation for Water Year 2008 (Oct. 1 – Sep.30) for four SNOTEL sites.





## Discussion

The 2008 field season marked the second year of operational climate monitoring within CAKN. Annual maintenance was performed on all climate and snow monitoring instruments in the three CAKN parks including, sensor replacement, troubleshooting, upgrades, data downloads, and sensor calibrations. Station maintenance logs were used to keep track of the climate station inventory for DENA, WRST, and YUCH which includes; sensors, data loggers, towers, solar panels, and batteries. Sensor and power performance was tracked and instrumentation was replaced as necessary.

A fourth snow telemetry (SNOTEL) site was added to the network in Wrangell-St. Elias under a contract with the Natural Resources Conservation Service (NRCS). The installation involved complex logistics including multiple helicopter sling-loads, fixed-wing crew transports, remote staging, and staff scheduling. The data from this station are transmitted hourly via meteor burst communication and are on-line at <http://www.ambcs.org/SiteViewer.shtml>. This site will provide year round precipitation data including a tipping bucket for summer rainfall, an all-weather gage for mixed precipitation and snowfall, and a snow depth sensor. The combination of all of these measurements will give us a comprehensive picture of total precipitation. In addition to these measurements the site also measures and records air temperature and solar radiation. This is the fourth of five SNOTEL sites planned for the network.

The CAKN climate stations transmit data via satellite and are available on the web at <http://www.wrcc.dri.edu/NPS.html>. Data products that are available on the web include daily and monthly summaries, time series graphs, wind rose graphs, data inventories, and station metadata for all of the automated stations. The data are downloaded from the stations each year and are QA/QC by network staff and sent to WRCC to fill in any gaps from missed satellite transmissions. The raw data are also available for download through the 'data lister' tool on the WRCC website.

In 2008, a regional I&M project was initiated with Oregon State University and the PRISM (Parameter-elevation **R**egressions on **I**ndependent **S**lopes **M**odel) group to update the gridded climate maps for the Alaska region. Chris Daly, the Principal Investigator for the project traveled to Alaska to do site reconnaissance and meet with local climate experts. Data were processed for inclusion in the model and the final station list is being prepared for review by the National Weather Service, the Natural Resource Conservation Service, and other partners in this effort. Some of the new CAKN climate stations with 4 and 5 year records are being included in the analysis and will help refine the current maps.

This annual report summarized the climate for the CAKN region with brief references to the Alaska regional climate and the global climate. For a graphic display of worldwide significant climate anomalies for 2008 see Appendix D.



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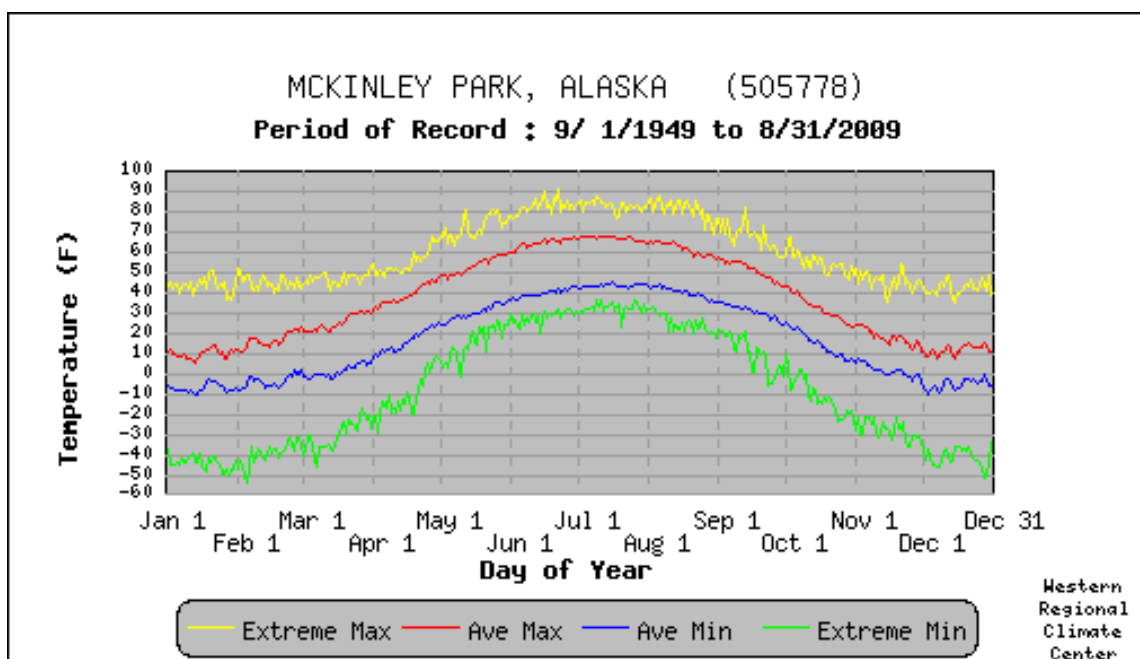
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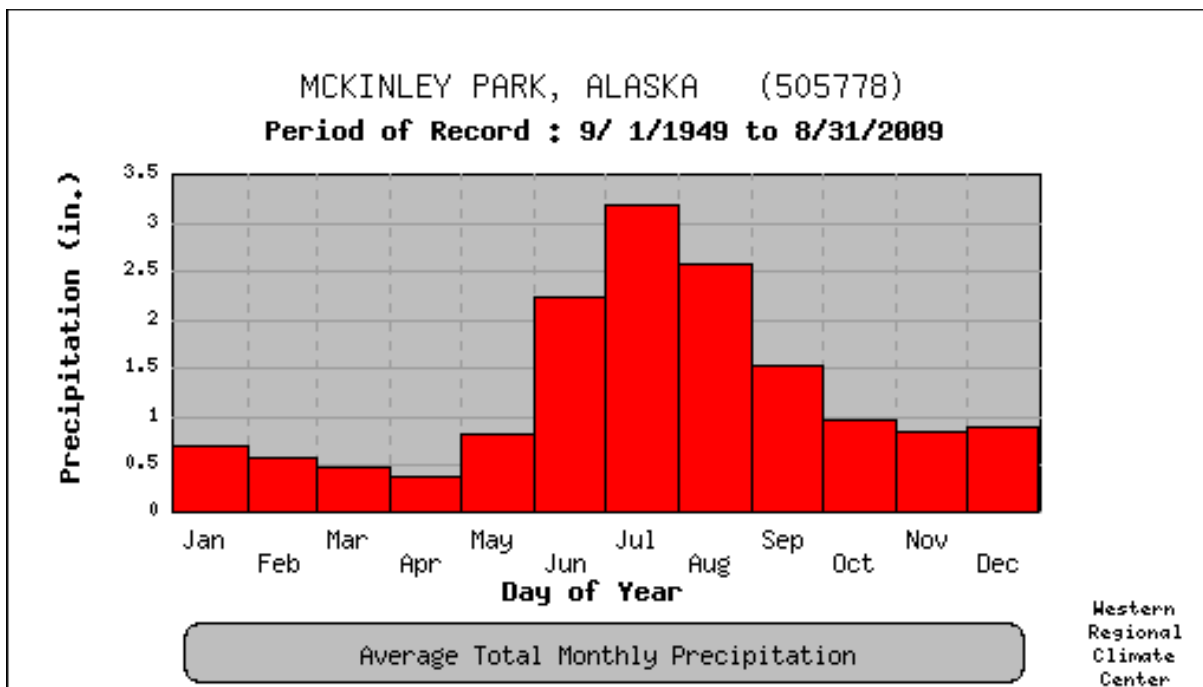
## Appendix A. Period of Record means for long-term sites in CAKN

### McKinley Park Period of Record Monthly Climate Summary

Period of Record: 9/ 1/1949 to 8/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	9.5	16.0	24.9	38.6	53.5	64.3	66.5	61.5	50.5	32.1	17.5	11.2	37.2
Average Min. Temperature (F)	-7.6	-4.3	0.8	15.7	29.8	39.6	43.3	39.9	30.6	14.2	1.0	-5.7	16.5
Average Total Precipitation (in.)	0.7	0.6	0.5	0.4	0.8	2.3	3.2	2.6	1.6	1.0	0.8	0.9	15.3
Average Total Snow Fall (in.)	10.4	9.8	7.8	5.3	3.0	0.3	0.0	0.0	4.3	12.7	13.2	13.4	80.3
Average Snow Depth (in.)	17.0	20.0	21.0	17.0	2.0	0.0	0.0	0.0	1.0	3.0	8.0	13.0	8.0

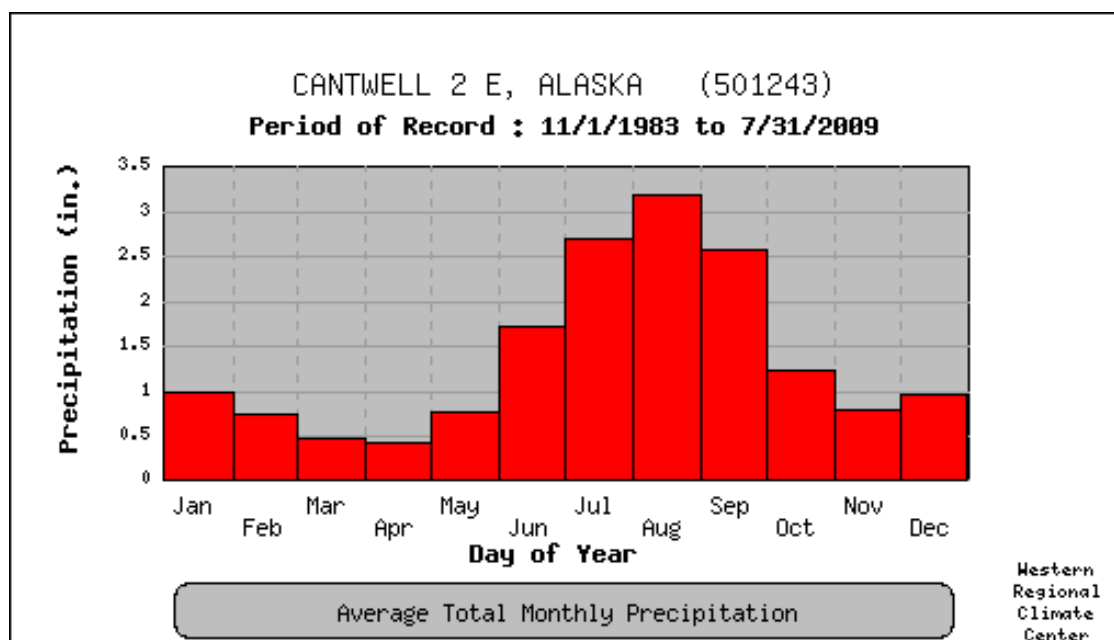
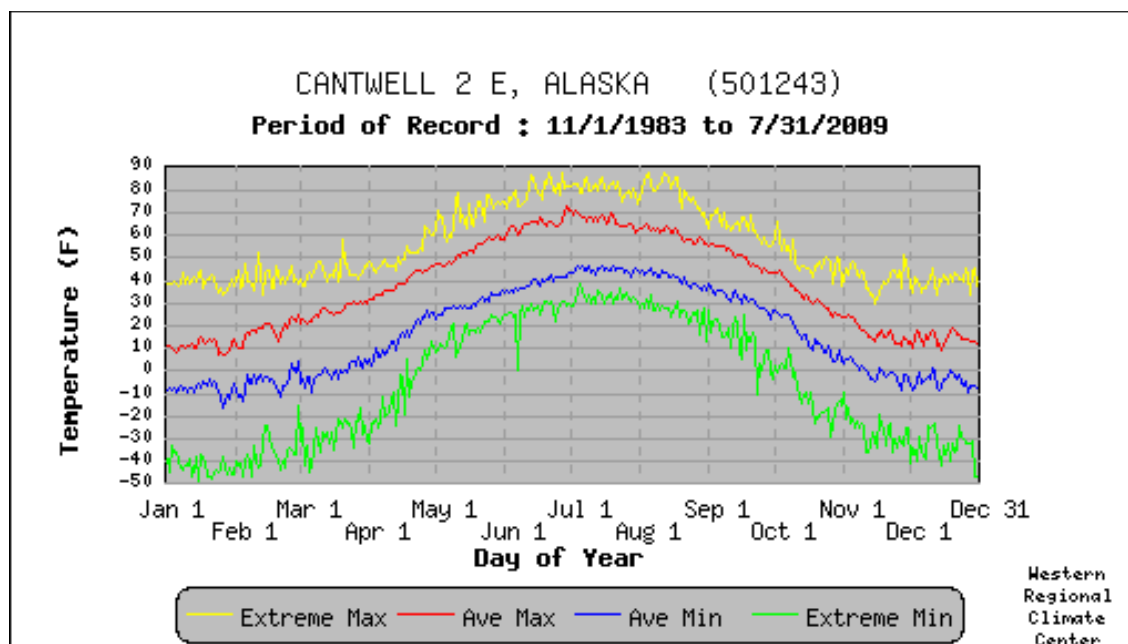




### Cantwell Period of Record Monthly Climate Summary

Period of Record : 11/1/1983 to 7/31/2009

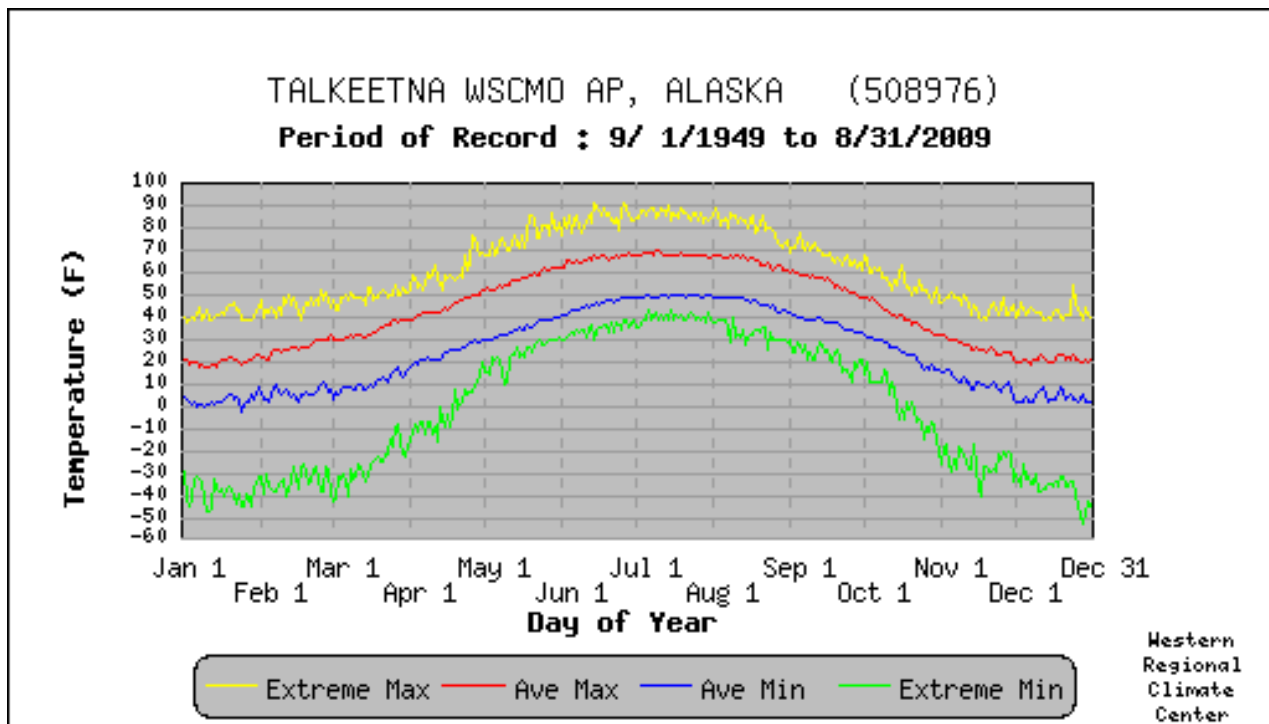
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	10.7	17.5	25.6	38.5	52.7	64.8	66.0	60.5	49.7	32.2	16.8	14.3	37.4
Average Min. Temperature (F)	-8.8	-5.5	-1.0	14.6	28.8	38.2	44.2	40.3	30.9	14.3	-0.8	-5.0	15.9
Average Total Precipitation (in.)	1.0	0.8	0.5	0.4	0.8	1.7	2.7	3.2	2.6	1.2	0.8	1.0	16.6
Average Total Snow Fall (in.)	22.3	15.8	12.7	10.8	5.2	0.2	0.3	0.0	4.0	16.2	17.9	20.5	125.7
Average Snow Depth (in.)	24.0	28.0	29.0	21.0	3.0	0.0	0.0	0.0	0.0	3.0	9.0	15.0	11.0



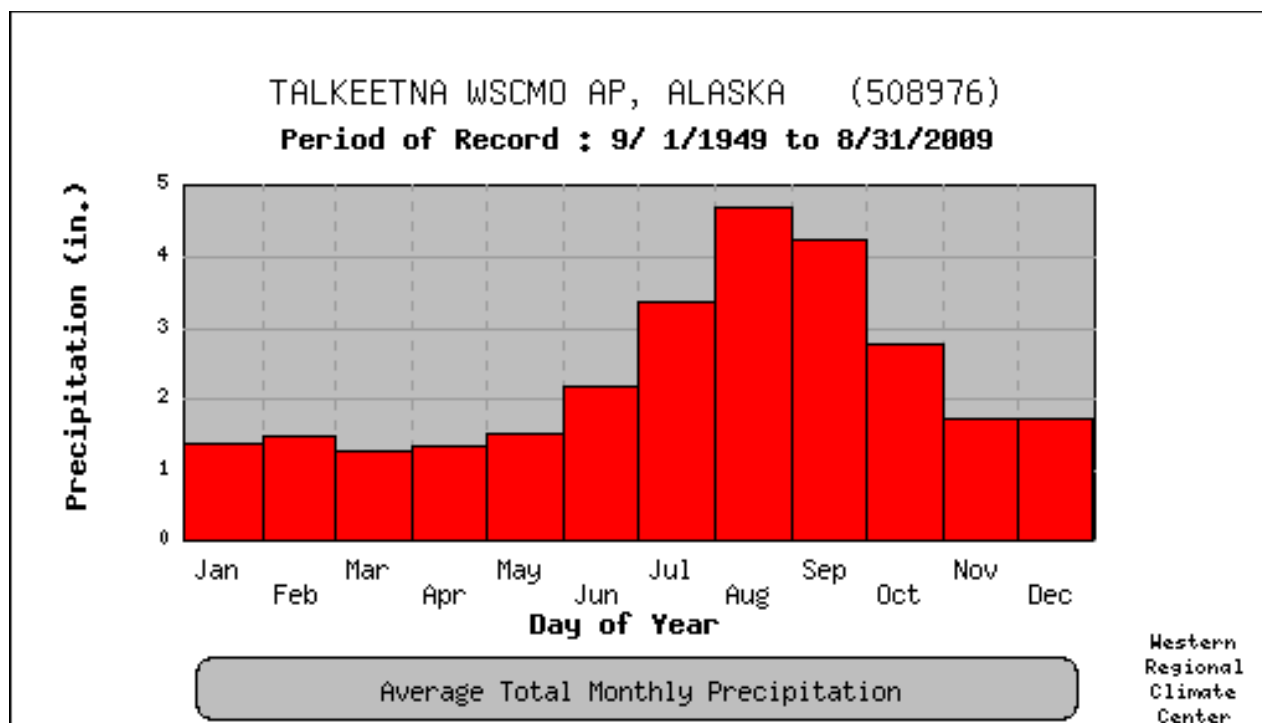
## Talkeetna Period of Record Monthly Climate Summary

Period of Record: 9/ 1/1949 to 8/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	19.6	26.0	33.5	44.6	56.9	65.8	68.0	64.7	55.5	39.8	26.3	20.4	43.4
Average Min. Temperature (F)	1.8	5.6	9.9	23.4	34.7	45.3	49.6	46.3	37.3	23.9	10.0	3.5	24.3
Average Total Precipitation (in.)	1.4	1.5	1.3	1.4	1.5	2.2	3.4	4.7	4.2	2.8	1.7	1.7	27.7
Average Total Snow Fall (in.)	18.6	20.0	17.1	9.2	0.9	0.0	0.0	0.0	1.2	11.6	19.2	22.8	120.6
Average Snow Depth (in.)	27.0	30.0	31.0	18.0	2.0	0.0	0.0	0.0	0.0	2.0	8.0	17.0	11.0



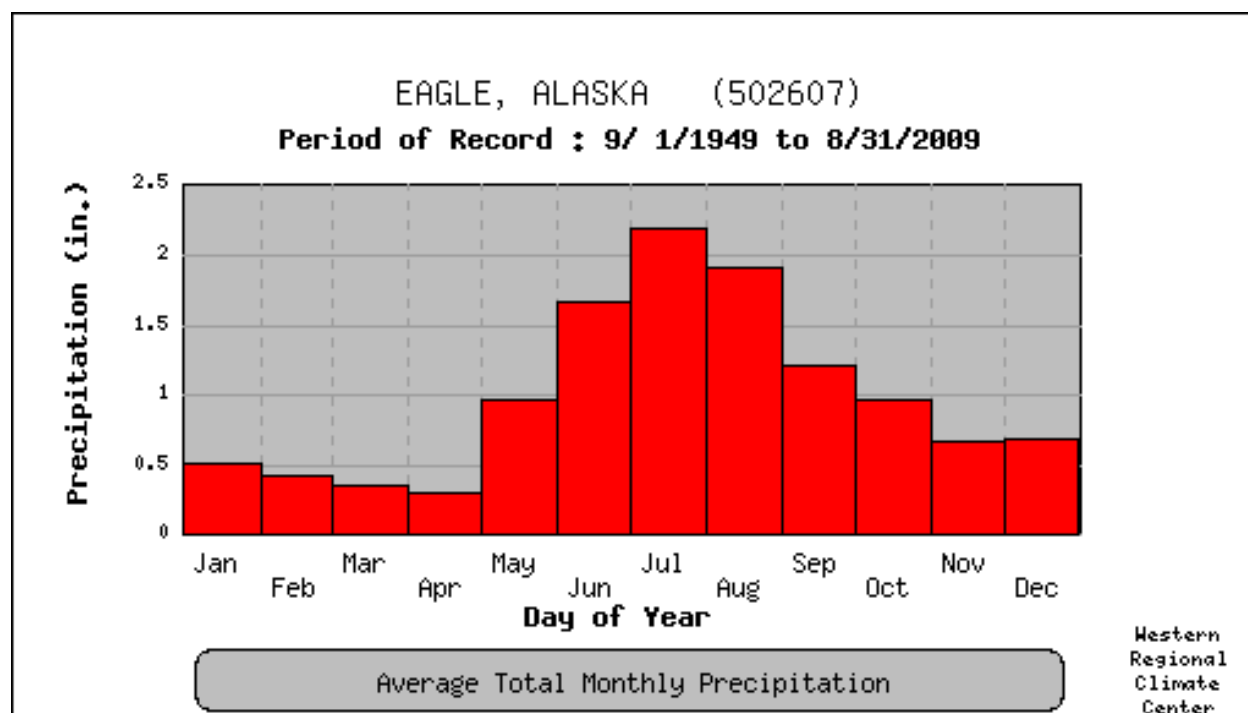
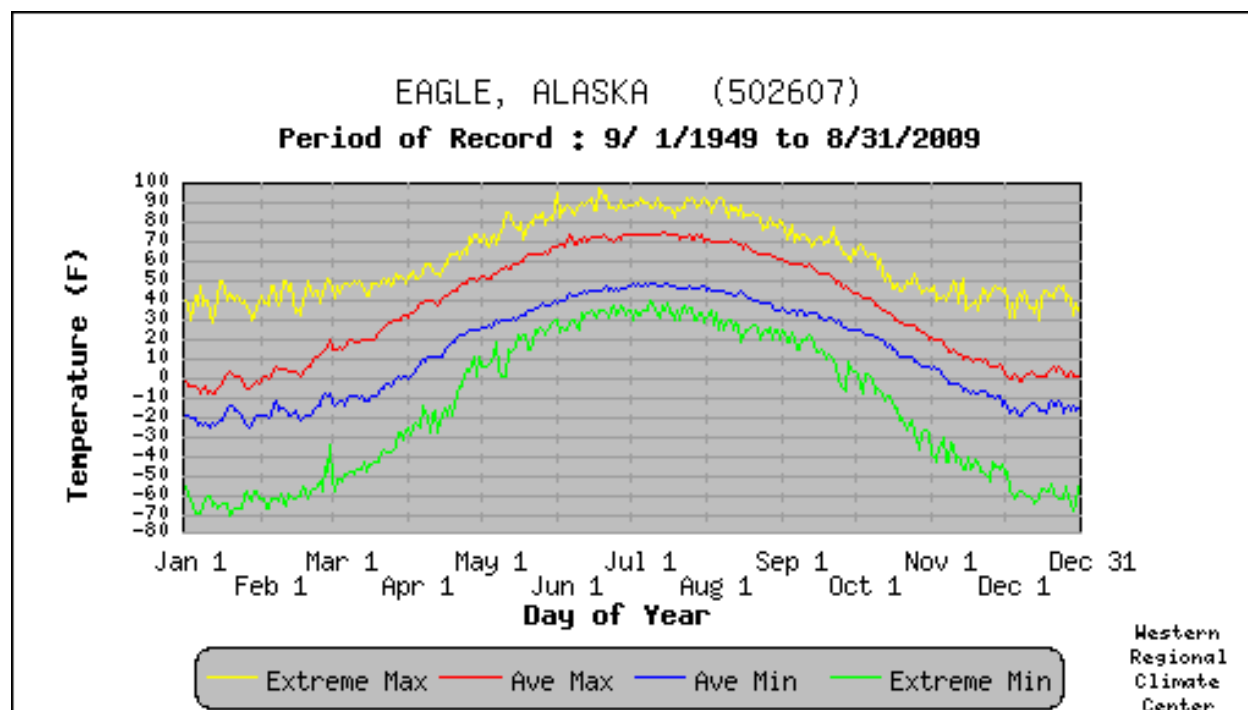




### Eagle Period of Record Monthly Climate Summary

Period of Record: 9/ 1/1949 to 8/31/2009

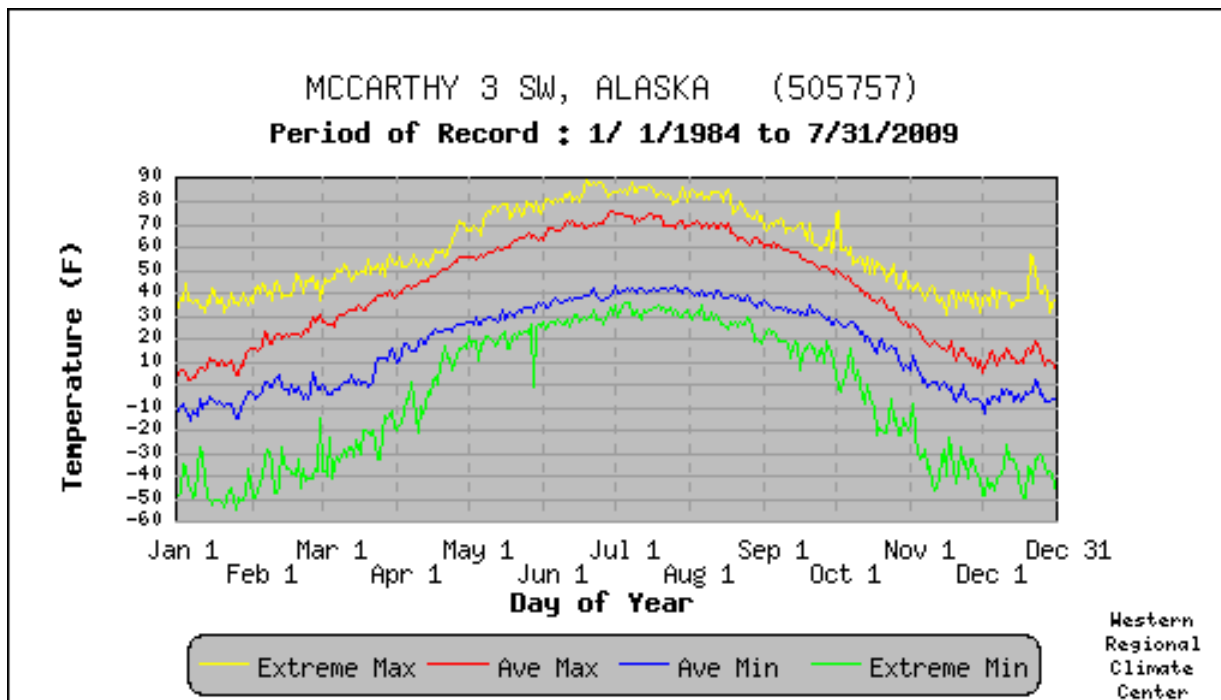
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	-3.7	5.1	21.9	42.1	59.0	70.9	72.9	66.8	53.7	32.1	11.5	1.2	36.1
Average Min. Temperature (F)	-21.4	-17.0	-8.1	14.2	31.8	43.7	47.0	41.1	30.6	14.8	-4.9	-15.7	13.0
Average Total Precipitation (in.)	0.5	0.4	0.4	0.3	1.0	1.7	2.2	1.9	1.3	1.0	0.7	0.7	12.0
Average Total Snow Fall (in.)	7.7	6.8	5.3	3.0	0.8	0.0	0.0	0.0	0.9	9.7	10.6	11.3	56.2
Average Snow Depth (in.)	17.0	20.0	20.0	13.0	0.0	0.0	0.0	0.0	0.0	3.0	8.0	13.0	8.0

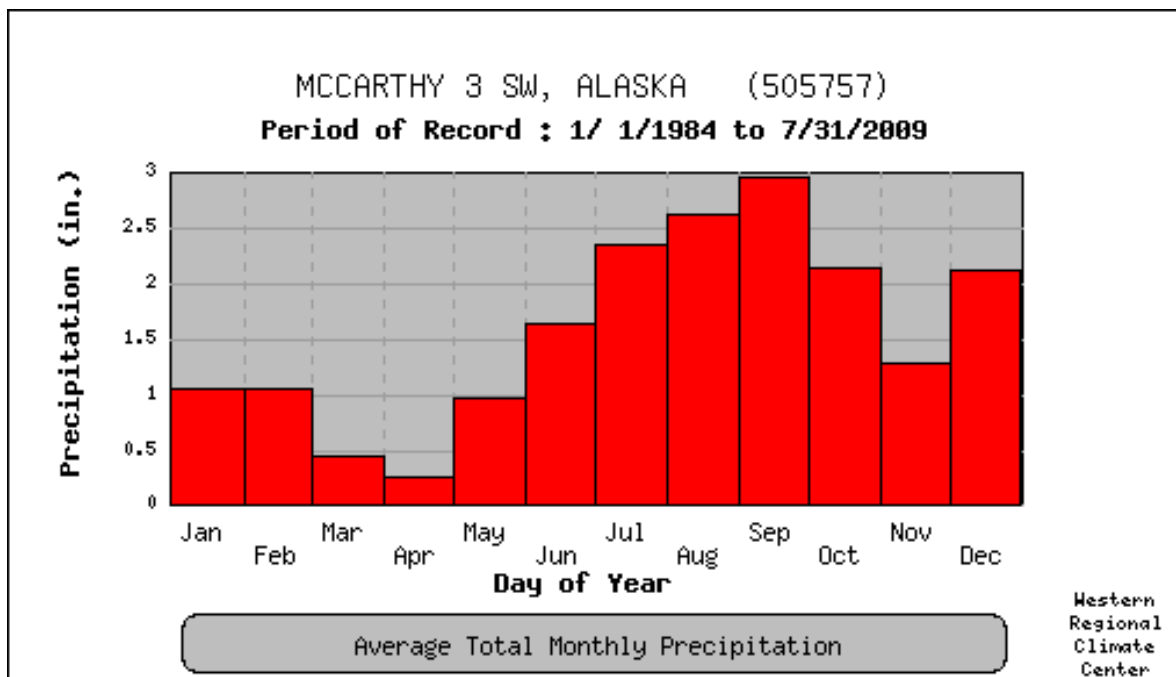


## McCarthy Period of Record Monthly Climate Summary

Period of Record: 1/ 1/1984 to 8/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	8.4	21.0	33.1	47.2	60.0	69.3	71.6	66.6	55.5	37.7	16.5	12.5	41.6
Average Min. Temperature (F)	-8.9	-2.1	3.0	20.3	29.8	37.5	41.3	38.2	31.3	18.7	-1.1	-4.1	17.0
Average Total Precipitation (in.)	1.1	1.0	0.4	0.3	1.0	1.6	2.3	2.6	3.0	2.2	1.3	2.1	19.0
Average Total Snow Fall (in.)	12.6	8.9	5.7	2.6	0.2	0.0	0.0	0.0	2.6	10.4	13.5	12.4	68.9
Average Snow Depth (in.)	17.0	21.0	23.0	13.0	0.0	0.0	0.0	0.0	0.0	2.0	8.0	13.0	8.0

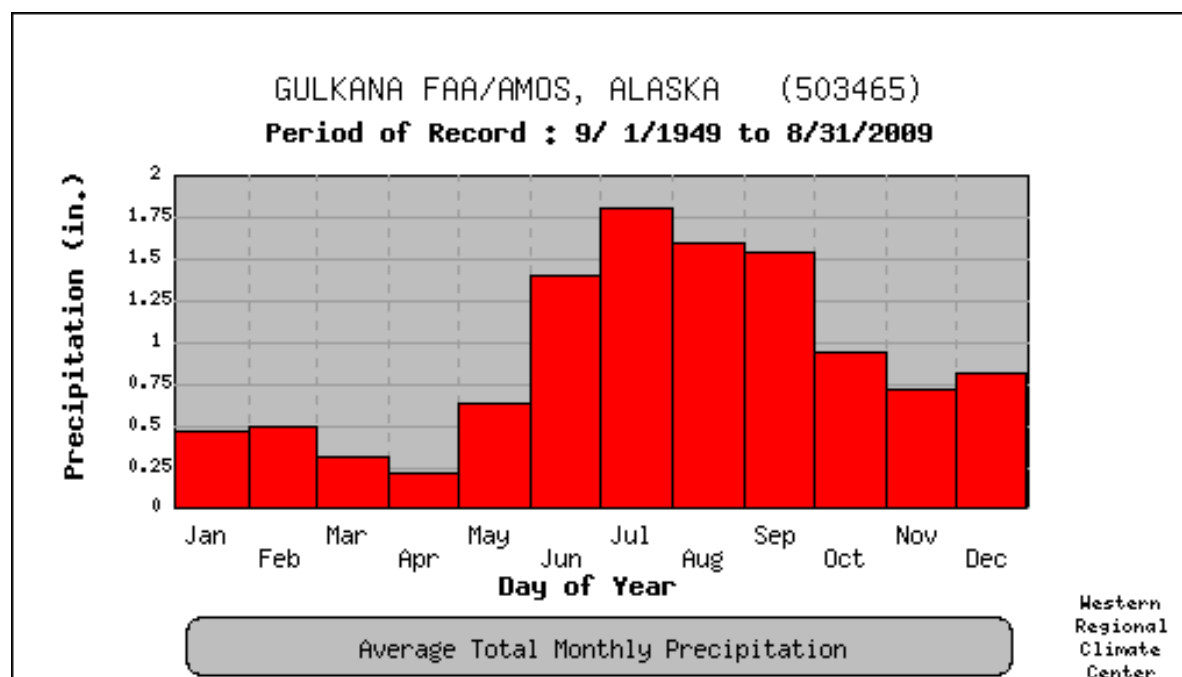
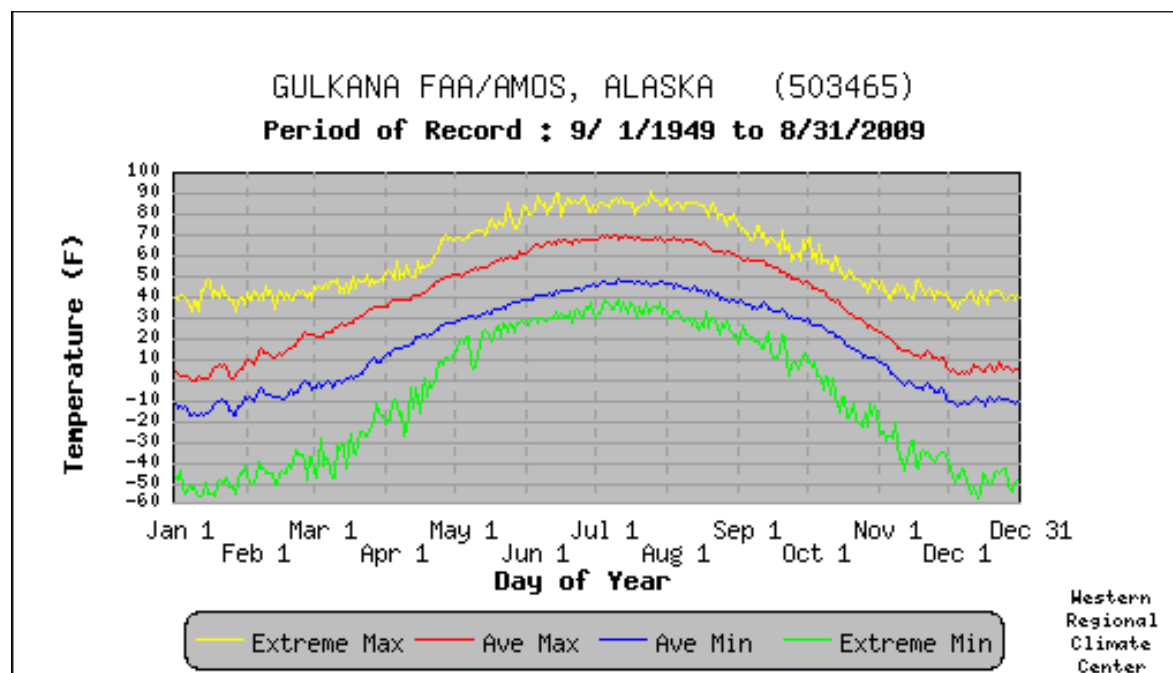




### **Gulkana Period of Record Monthly Climate Summary**

Period of Record: 9/ 1/1949 to 8/31/2009

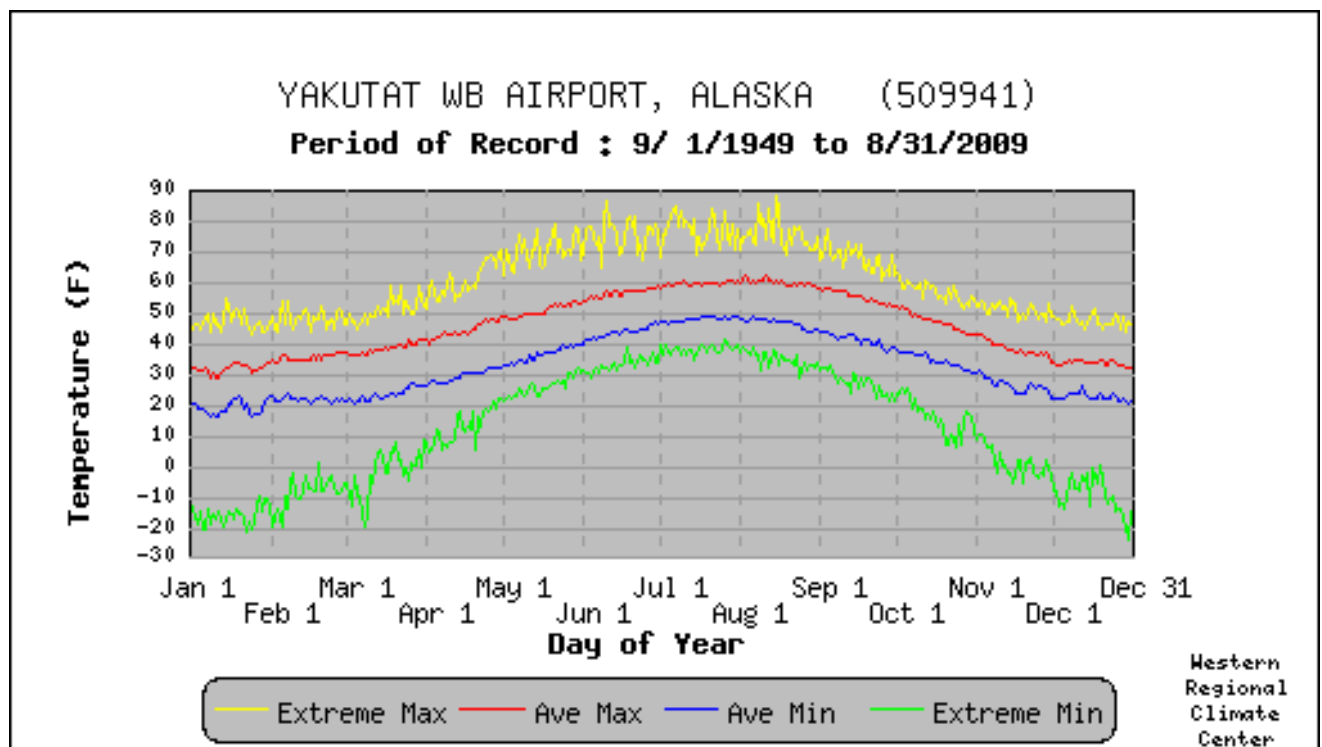
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	2.6	14.1	27.9	42.3	55.6	65.7	68.5	64.8	53.8	35.1	14.2	5.0	37.5
Average Min. Temperature (F)	-14.0	-6.9	1.6	19.8	32.8	42.3	46.3	42.3	33.3	18.5	-1.3	-10.8	17.0
Average Total Precipitation (in.)	0.5	0.5	0.3	0.2	0.6	1.4	1.8	1.6	1.6	1.0	0.7	0.8	11.0
Average Total Snow Fall (in.)	7.1	7.6	5.0	2.6	0.5	0.0	0.0	0.1	1.1	8.0	8.9	10.3	51.2
Average Snow Depth (in.)	14.0	16.0	14.0	5.0	0.0	0.0	0.0	0.0	0.0	2.0	6.0	11.0	6.0



## Yakutat Period of Record Monthly Climate Summary

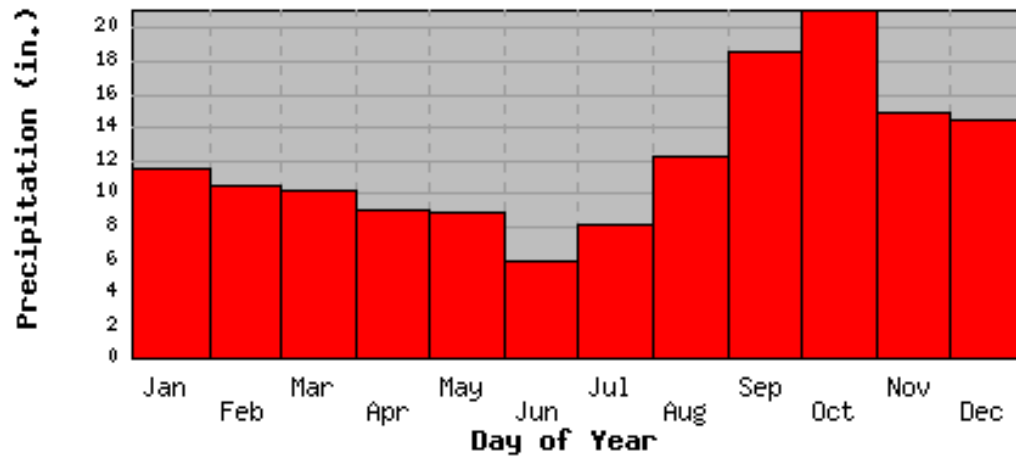
Period of Record: 9/ 1/1949 to 8/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	31.6	35.4	38.3	44.4	50.8	56.5	59.8	60.2	55.4	47.3	38.4	33.8	46.0
Average Min. Temperature (F)	18.8	21.6	23.3	29.2	36.5	43.7	48.0	46.7	41.2	34.4	26.3	22.4	32.7
Average Total Precipitation (in.)	11.5	10.4	10.2	9.0	8.8	6.0	8.1	12.2	18.5	21.0	14.8	14.5	144.8
Average Total Snow Fall (in.)	35.4	35.4	36.9	15.3	1.0	0.0	0.0	0.0	0.0	4.8	20.9	36.1	185.9
Average Snow Depth (in.)	14.0	17.0	20.0	11.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	9.0	6.0



YAKUTAT WB AIRPORT, ALASKA (509941)

Period of Record : 9/ 1/1949 to 8/31/2009



Average Total Monthly Precipitation

Western  
Regional  
Climate  
Center





## Appendix B. 2008 Extremes at long-term stations

Daily summary stats retrieved from:

<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak5778>

Monthly summary stats retrieved from:

<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak5778>

### McKinley Park - 2008 Records – 84 years

Record High Temperatures °F	48	Feb 20
	55, 58, 58	Apr 22, 23, 24
Record Low Temperatures °F	24	May 30, 31
	32	Jul 24
	-34	Dec 31
Record High Precipitation – In.	0.29	Apr 14
	0.19, 0.29	Apr 25, 26
	0.56	Jul 1
	1.04	Jul 30
	0.39	Nov 5
	0.18	Dec 7
Record High Snowfall – In.	6.7	Apr 14
	4.5	Apr 18
	2.6	Apr 25
	2.5	Dec 7

### Talkeetna – 2008 Records – 58 years

Record High Temperatures °F	46	Feb 19
	48	Mar 9
Record Low temperatures °F	39	Aug 6
	16	Oct 9
Record High Precipitation – In.	0.88	Jan 20

### Cantwell – 2008 records – 25 years

Record High Temperatures °F	36, 36, 46, 42	Feb 17, 18, 19, 20
	43	Mar 7
	52	Apr 22, 23
	82	Jul 4
	63	Sep 1
Record Low temperatures °F	-37	Feb 6
	-33	Feb 9
	-13	Apr 11
	20	May 30
	27, 28	Jun 25, 26
	28	Jul 2
	27	Aug 12

	-3	Oct 9
	-18, -16	Oct 28, 29
	-34	Dec 2
	-24	Dec 12
	-31	Dec 29
Record Precipitation	0.22	Jan 21
	0.39	Mar 8
	0.32	Apr 25
	0.39	Jul 18
	0.42	Jul 31
	0.64	Aug 5
	0.89	Sep 11
	1.50	Oct 23
Record Snowfall - Inches	5.3	Jan 21
	6.3	Mar 8
	1.6	Dec 7
Coldest July on Record	51.9	2008

#### **Eagle – 2008 Records -53 years**

Record High Temperatures °F	29	Feb 16
	44, 42	Feb 21, 22
Record Low Temperatures °F	29	May 31
	33	Jul 29
	25	Aug 30
Record Precipitation – In.	0.16	Jan 2
	0.24	Apr 27
	0.25	May 1
	1.02	Jul 2
	0.33	Sep 11
	0.58	Oct 3
Record Snowfall – In.	3.0	Jan 2
	4.0	Feb 16
	2.0	Oct 15
Wettest July on Record	6.04	2008

#### **McCarthy 2008 Records – 23 years of data**

Record high Temperatures °F	41, 40	Feb 18, 22
	46	Mar 5, 6
	56	Apr 22
Record Low Temperatures °F	3, 0	Apr 17, 18
	30	Jun 28, Jun 30
	29	Jul 2
	30	Jul 8
	29	Jul 29

	28	Aug 11
	7	Oct 8
	-16	Oct 25
	-20	Oct 31
	-38, -45	Dec 29Dec 31
Record Precipitation	0.36	Feb 17
	0.19	Feb 29
	0.03, 0.02	Apr 14, 16
	0.03, 0.26	Apr 28, 29
	0.42	Jul 19
	0.98	Jul 28
	1.15, 0.79	Aug 5, 6
	0.64, 0.32	Oct 2, 3
	0.24	Oct 22
Record Snowfall – In.	2.7	Feb 29
	9.0	Mar 31
	1.0	Apr 12
	1.6	Apr 16
	6.2, 5.1	Oct 2, 3
	2.8	Oct 22
	3.3	Oct 24
	2.2	Nov 1
	2.4	Dec 26
Driest May on Record– In.	0.12	May Total
Coldest July on Record °F	53	July Mean

#### **Yakutat 2008 records – 60 years of data**

Record High temperatures °F:	45	Mar 5
Record Low temperatures °F	-6	Feb 8
	34	Jun 30
	37	Aug 10
Record precipitation – Inches	2.2	Feb 17
	1.71	Mar 6
	2.02	May 12
	1.71	Jun 4
	3.43	Jul 25

#### **Gulkana 2008 records – 58 years of data**

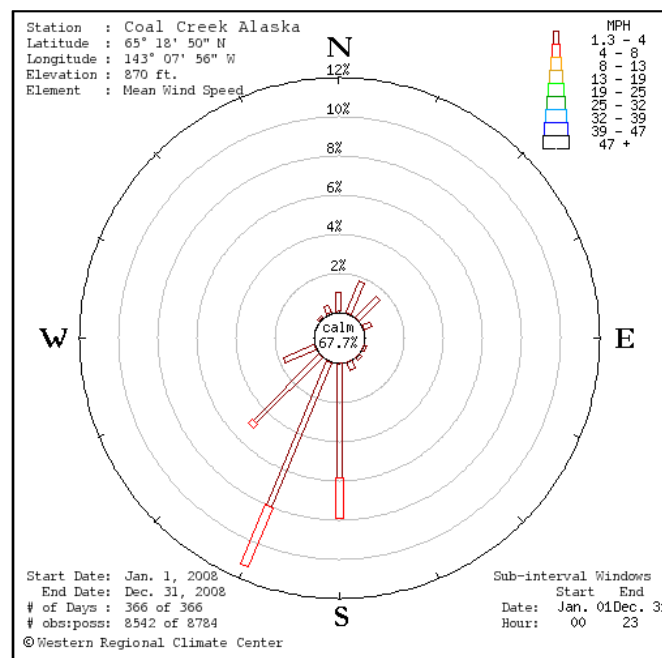
Record High temperatures °F	39	Feb 14
	42, 40, 39	Feb 18, 19, 20
	44	Mar 7
	56, 59	Apr 21, 22
Record Low temperatures °F	-40	Feb 6

	-6	Apr 17
	24	May 14
	30, 31	Jun 25, 26
	29, 32	Jul 1,2
	-17	Oct 29
Record precipitation - Inches	0.14	Feb 29
	0.19	Apr 15
	0.09	Apr 27, 30
	0.45	Jul 9
	0.56	Sep 30
	0.69	Oct 2
	0.42	Dec 4
Wettest April on Record	1.03	April Total
Wettest July on Record	4.12	July Total

## Appendix C: CAKN Climate Station Monthly Data

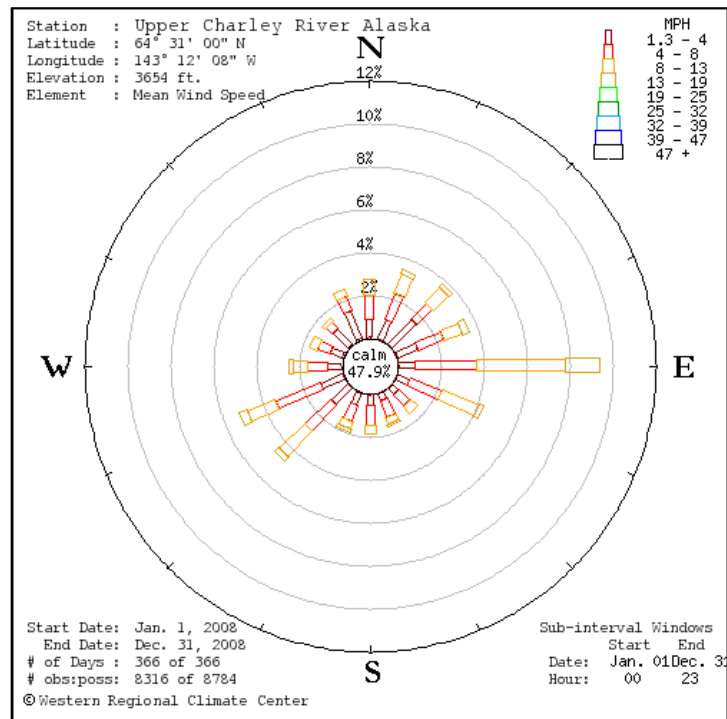
### Coal Creek Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	30	1	172	10	-16	27	-49	23	27	17	74	92	46	12
02/2008	751	1	202	9	-9	40	-54	15	18	0	72	97	39	12
03/2008	4318	2	205	9	7	42	-41	17	18	16	69	94	31	13
04/2008	7868	2	208	12	31	57	0	22	28	17	70	100	25	10
05/2008	12692	2	212	15	48	71	29	29	30	28	56	100	19	0
06/2008	12291	1	211	13	57	78	35	30	31	30	64	100	14	0
07/2008	18547	1	206	13	56	77	35	31	31	31	75	100	22	1
08/2008	14374	1	208	8	49	67	25	32	32	31	78	100	20	1
09/2008	7003	1	207	8	41	68	16	32	32	31	83	100	26	1
10/2008	2288	1	206	10	12	46	-25	31	31	31	85	99	47	6
11/2008	193	1	164	8	0	27	-23	31	31	31	85	95	74	10
12/2008	23	1	147	8	-18	19	-51	31	31	29	75	89	57	16



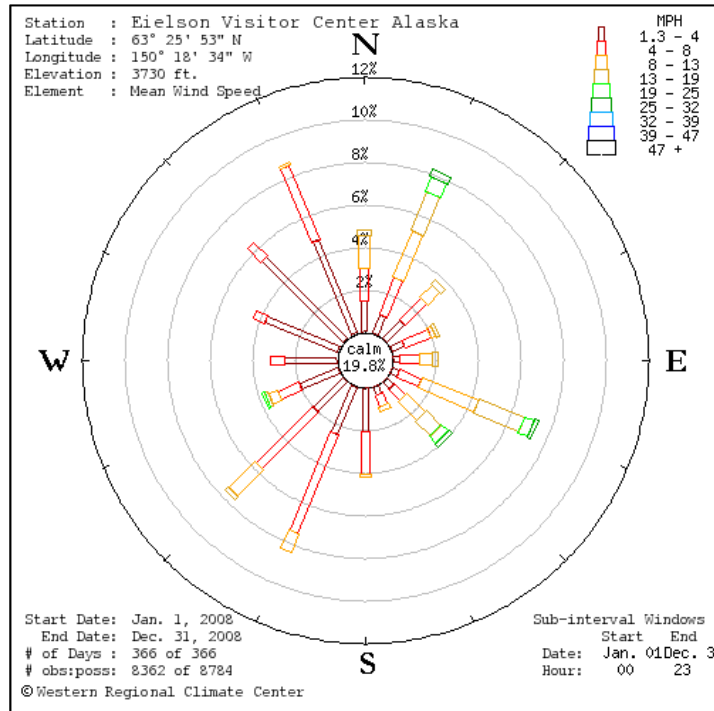
## Upper Charley River Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature – 4 Inches			Average Relative Humidity		Snow Depth	
Date	ly	mph	Deg	mph	Deg F			Deg F			%		in	
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	96	0	13	0	-10.1	25	-34	m	m	m	81	99	60	17
02/2008	1233	5	68	24	-2.6	30	-32	m	m	m	83	99	45	12
03/2008	5677	6	74	29	8.5	36	-30	m	m	m	79	96	35	12
04/2008	10527	6	219	27	25.2	46	-2	m	m	m	74	100	34	15
05/2008	12835	7	90	28	39.7	59	23	m	m	m	63	100	23	2
06/2008	11727	5	280	27	48.4	65	34	m	m	m	67	100	24	0
07/2008	11080	6	228	25	48.1	65	36	m	m	m	72	100	4	1
08/2008	7582	4	10	20	43.3	60	31	m	m	m	71	100	0	6
09/2008	4608	3	359	17	37.7	57	18	m	m	m	26	100	0	5
10/2008	2143	0	360	11	13.2	39	-13	m	m	m	43	100	0	11
11/2008	176	0	0	0	7.1	22	-11	m	m	m	14	30	0	16
12/2008	79	0	0	0	-4.5	16	-30	m	m	m	5	33	0	28



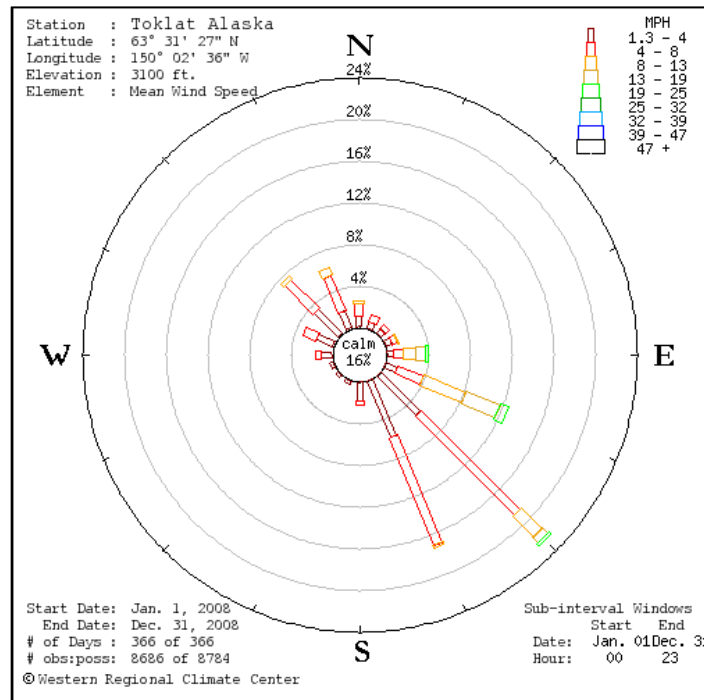
### Eielson Visitor Center Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Relative Humidity		
Date	ly	mph	Deg	mph	Deg F			%		
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.
01/2008	379	5	318	48	7	45	-28	68	99	14
02/2008	2116	8	352	38	10	36	-22	55	98	13
03/2008	5053	6	29	43	17	34	-16	63	99	23
04/2008	9501	5	240	33	22	51	-5	74	100	21
05/2008	15138	6	118	33	37	50	20	63	100	23
06/2008	12633	5	202	23	45	62	35	74	100	25
07/2008	10134	5	214	25	47	67	34	79	100	16
08/2008	8808	5	251	18	45	57	33	80	100	38
09/2008	6235	5	122	26	39	55	18	69	100	18
10/2008	2835	4	294	35	18	36	-2	69	99	23
11/2008	787	4	324	33	14	32	-13	67	97	24
12/2008	179	6	322	39	16	41	-18	61	98	12



## Toklat Alaska

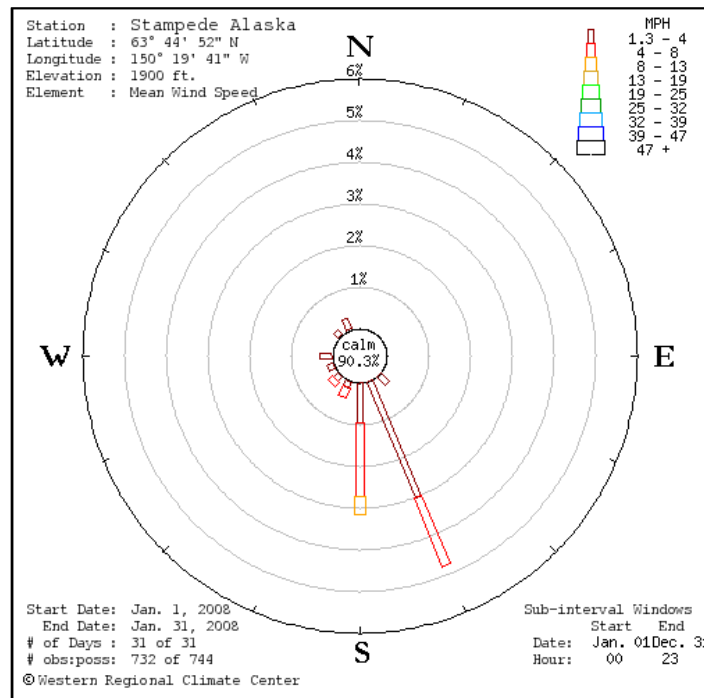
	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature – 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	322	5	143	40	1	45	-34	23	27	0	73	98	31	7
02/2008	1608	7	134	40	2	43	-43	24	27	19	69	96	34	8
03/2008	6036	7	141	31	14	37	-33	26	29	22	69	95	37	5
04/2008	8817	5	96	30	23	48	-6	28	31	19	72	99	26	4
05/2008	14017	6	125	37	39	52	22	39	54	31	62	99	24	1
06/2008	11747	4	133	22	47	63	32	50	63	40	68	98	25	1
07/2008	10309	4	90	23	49	69	33	53	66	44	75	98	20	3
08/2008	8273	3	169	21	45	60	31	48	58	40	80	98	36	2
09/2008	5981	5	136	28	39	57	4	40	51	32	73	100	35	1
10/2008	2766	4	146	29	14	39	-8	29	32	25	77	99	44	6
11/2008	630	4	154	51	8	33	-24	24	27	0	76	95	42	7
12/2008	156	5	148	32	6	33	-33	24	26	0	71	93	20	8





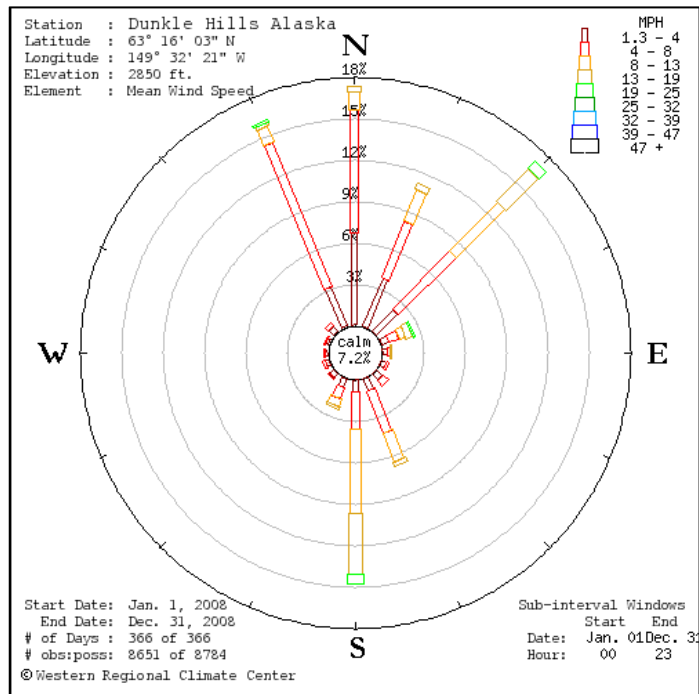
## Stampede Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature – 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	108	0	357	18	-6	48	-40	18	21	15	78	99	33	15
02/2008	864	1	165	17	-4	48	-48	16	20	11	71	92	33	17
03/2008	5533	1	164	13	11	46	-24	18	22	13	71	98	30	17
04/2008	7667	2	178	13	26	55	-14	25	32	19	70	98	19	17
05/2008	12098	2	145	16	42	60	23	41	57	32	64	99	23	2
06/2008	11168	2	162	13	51	70	32	53	65	42	70	99	20	0
07/2008	9475	1	156	11	52	77	33	55	70	46	75	99	14	0
08/2008	8060	1	129	10	47	67	29	50	60	41	81	99	32	1
09/2008	5189	1	140	13	39	64	4	43	54	32	82	100	28	0
10/2008	1695	1	183	11	13	46	-20	29	32	24	83	98	41	5
11/2008	136	1	204	9	0	33	-29	24	27	21	82	94	52	9
12/2008	33	1	214	10	-4	27	-43	21	22	19	81	95	52	15



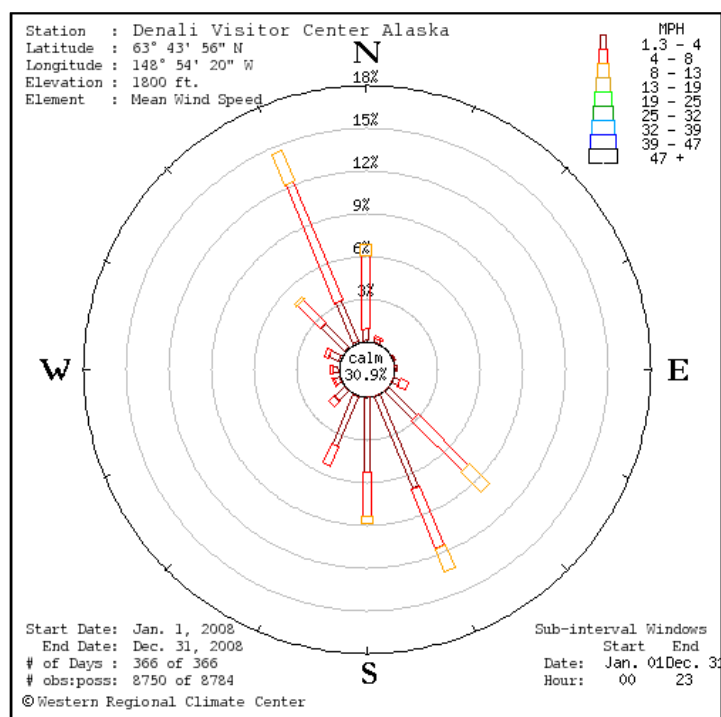
## Dunkle Hills Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	580	7	22	44	4	29	-26	28	30	24	79	100	38	26
02/2008	3074	8	22	41	6	41	-27	23	29	19	73	100	29	28
03/2008	7530	5	9	26	16	37	-19	25	27	23	78	100	49	32
04/2008	12333	7	12	31	22	47	-6	27	29	26	80	100	45	35
05/2008	17832	6	351	28	36	48	23	31	37	29	73	100	32	18
06/2008	13687	7	173	25	46	64	31	43	51	31	76	100	33	2
07/2008	9657	7	164	25	48	73	34	48	56	43	83	100	21	1
08/2008	8734	5	86	21	46	62	32	48	53	43	83	100	36	0
09/2008	5566	5	71	21	39	59	12	42	49	32	83	100	34	0
10/2008	2836	6	19	26	18	37	-3	32	32	32	81	100	38	12
11/2008	838	7	22	29	13	33	-11	31	32	31	82	99	51	18
12/2008	294	8	17	29	7	30	-21	31	33	29	73	100	44	25



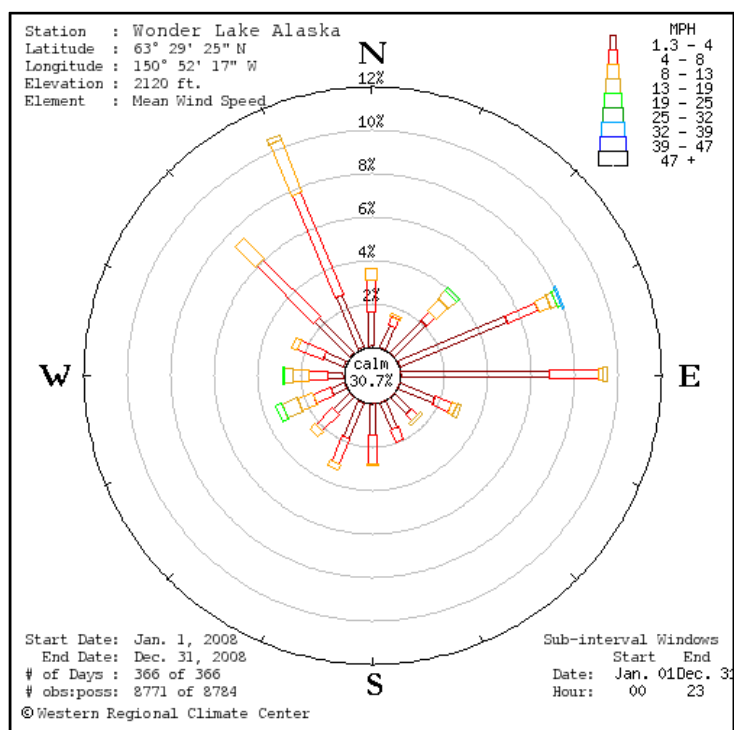
## Denali Visitor Center

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Total
01/2008	113	3	170	31	-5	38	-43	-6	37	-44	73	99	29	0
02/2008	1563	4	170	33	-1	52	-54	-3	49	-57	66	97	35	0
03/2008	6567	5	159	26	16	48	-35	15	53	-39	62	99	25	0
04/2008	7500	4	26	25	27	64	-11	28	71	-14	64	95	19	1
05/2008	16149	4	163	25	44	65	16	44	79	13	56	99	19	1
06/2008	14809	4	166	21	53	78	27	54	94	21	61	99	18	2
07/2008	11951	3	169	26	54	85	31	54	95	26	72	99	17	5
08/2008	10271	3	193	20	49	73	25	49	86	20	76	99	29	3
09/2008	5589	3	180	22	41	66	-1	40	78	-6	69	96	25	1
10/2008	1460	3	233	26	13	45	-19	11	50	-25	70	88	40	1
11/2008	209	2	214	24	3	33	-30	1	29	-33	66	85	43	0
12/2008	45	2	173	21	-6	32	-47	-8	30	-47	62	86	34	0



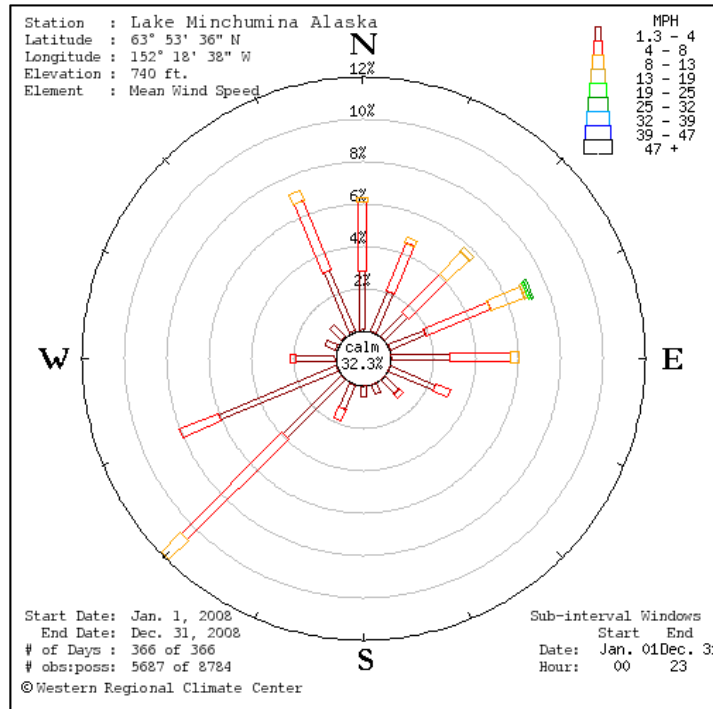
## Wonder Lake Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Total
01/2008	225	2	68	39	-3	46	-35	-4	44	-36	61	100	25	0
02/2008	1766	4	33	46	0	45	-38	0	48	-42	55	86	25	0
03/2008	6262	4	26	36	12	43	-21	13	54	-22	59	100	23	0
04/2008	9668	5	43	42	24	59	-10	26	69	-13	61	100	19	0
05/2008	12352	5	60	30	41	62	23	44	72	23	61	100	22	1
06/2008	10809	4	5	24	50	71	30	52	83	29	71	100	18	4
07/2008	10091	5	351	35	52	75	33	54	86	31	77	100	21	4
08/2008	8674	4	22	26	48	67	31	50	79	30	82	100	37	4
09/2008	6802	4	44	24	38	65	8	40	78	7	85	100	26	1
10/2008	3056	3	35	34	12	43	-16	14	55	-19	81	100	35	0
11/2008	589	2	73	28	1	35	-25	1	37	-26	75	100	49	0
12/2008	188	4	51	49	3	26	-35	3	26	-37	70	100	23	0



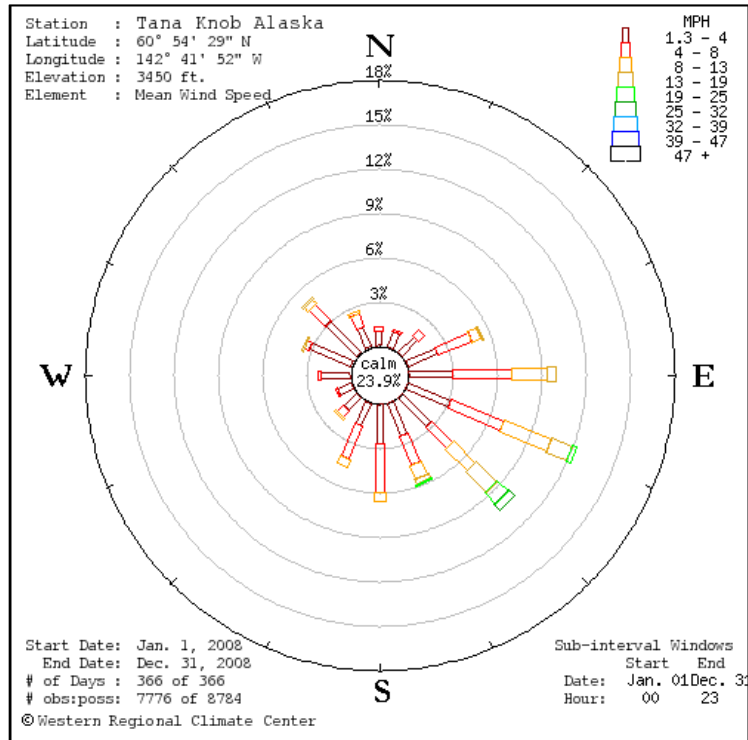
## Lake Minchumina Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Total
01/2008	m	m	m	m	m	m	m	m	m	m	m	m	m	m
02/2008	m	m	m	m	m	m	m	m	m	m	m	m	m	m
03/2008	m	m	m	m	m	m	m	m	m	m	m	m	m	m
04/2008	m	m	m	m	m	m	m	m	m	m	m	m	m	m
05/2008	10748	4	304	25	50	68	32	52	86	26	51	99	19	0
06/2008	12954	3	244	23	57	80	38	57	94	33	65	98	19	3
07/2008	11845	3	242	23	58	87	37	58	97	35	69	99	19	2
08/2008	9492	3	5	21	53	74	35	52	79	32	74	99	33	2
09/2008	5184	3	14	21	44	70	24	44	67	20	78	99	28	1
10/2008	1103	3	334	21	15	41	-14	15	49	-18	84	99	50	0
11/2008	112	2	340	19	3	22	-21	2	25	-22	85	94	62	0
12/2008	58	4	21	51	0	24	-35	3	17	-26	78	98	36	0



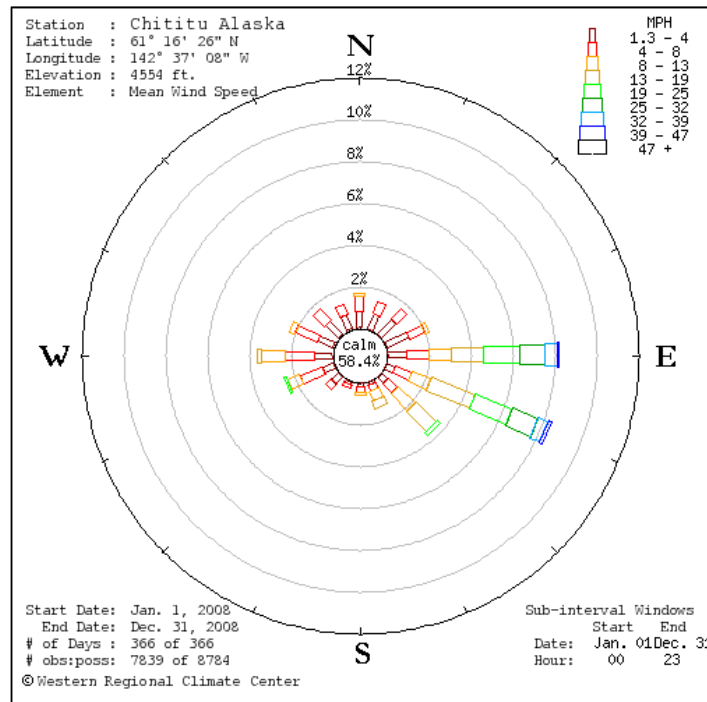
## Tana Knob Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	703	5	30	51	11	35	-19	31	31	31	79	100	26	35
02/2008	1458	6	113	47	17	40	-23	31	31	30	84	100	20	41
03/2008	6974	5	74	42	21	36	7	31	31	31	74	100	34	46
04/2008	10818	6	94	37	28	47	10	31	31	30	66	100	30	45
05/2008	15341	5	49	37	38	51	25	31	31	31	63	100	27	27
06/2008	14689	4	172	20	43	59	32	41	56	31	68	100	20	1
07/2008	11614	4	167	23	46	63	36	49	57	43	75	100	13	1
08/2008	9183	3	155	14	45	55	38	48	53	43	80	100	37	1
09/2008	4709	4	122	22	41	51	31	41	48	35	76	100	43	1
10/2008	1818	4	61	45	24	38	0	33	35	0	87	100	50	15
11/2008	614	5	80	44	20	32	-4	32	33	32	81	100	30	29
12/2008	90	3	33	24	20	33	0	32	32	32	92	100	63	40



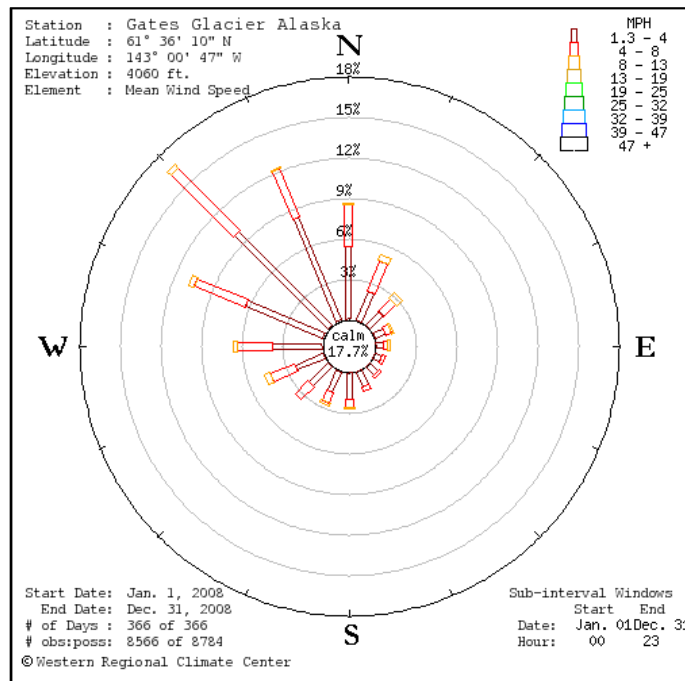
## Chititu Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	498	0	0	0	11	35	-20	13	18	3	11	95	0	m
02/2008	1310	0	0	0	11	39	-28	10	18	-1	26	100	1	m
03/2008	3350	0	0	0	19	36	-2	16	22	10	6	100	2	m
04/2008	3803	0	0	22	28	47	3	24	31	15	6	44	1	m
05/2008	5968	0	360	0	36	57	22	32	35	27	4	5	3	m
06/2008	3774	0	360	0	42	60	30	35	39	33	5	7	4	m
07/2008	5527	6	13	36	43	63	34	37	40	34	51	100	6	m
08/2008	7522	5	288	29	42	55	34	40	42	37	86	100	41	m
09/2008	3928	10	97	38	38	50	24	37	41	33	76	100	44	m
10/2008	2719	12	88	65	22	36	-1	32	33	31	79	100	36	m
11/2008	965	12	77	56	19	30	-4	30	32	26	65	97	18	m
12/2008	270	7	48	50	9	32	-21	20	29	12	75	99	23	m



## Gates Glacier Alaska

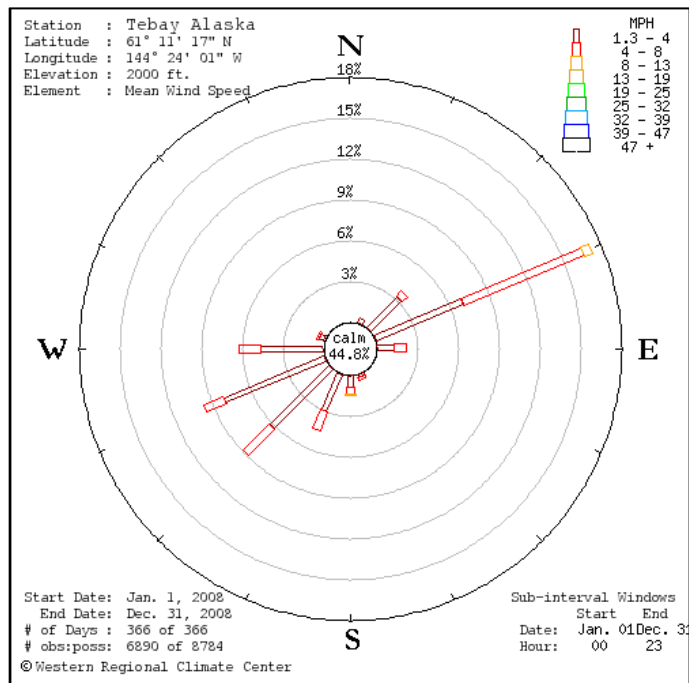
	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	602	3	330	30	13	37	-16	31	32	30	69	99	14	50
02/2008	1878	4	333	30	11	44	-22	30	32	30	72	99	21	59
03/2008	6603	3	324	23	20	36	4	31	31	0	63	99	28	69
04/2008	11429	3	320	27	26	46	5	31	31	31	72	100	36	74
05/2008	15809	4	290	22	37	51	24	31	31	31	62	100	30	55
06/2008	14548	3	271	20	42	58	31	45	62	31	71	100	26	7
07/2008	10398	3	273	19	44	62	32	49	64	39	78	100	14	6
08/2008	8238	3	286	18	43	54	34	47	58	40	80	100	33	8
09/2008	4016	3	322	20	37	49	23	39	49	34	78	100	43	6
10/2008	2222	3	315	25	22	36	-2	33	34	33	81	100	37	22
11/2008	863	4	324	25	20	34	-2	32	33	32	70	99	22	30
12/2008	301	3	314	19	12	33	-20	32	32	32	76	100	24	40





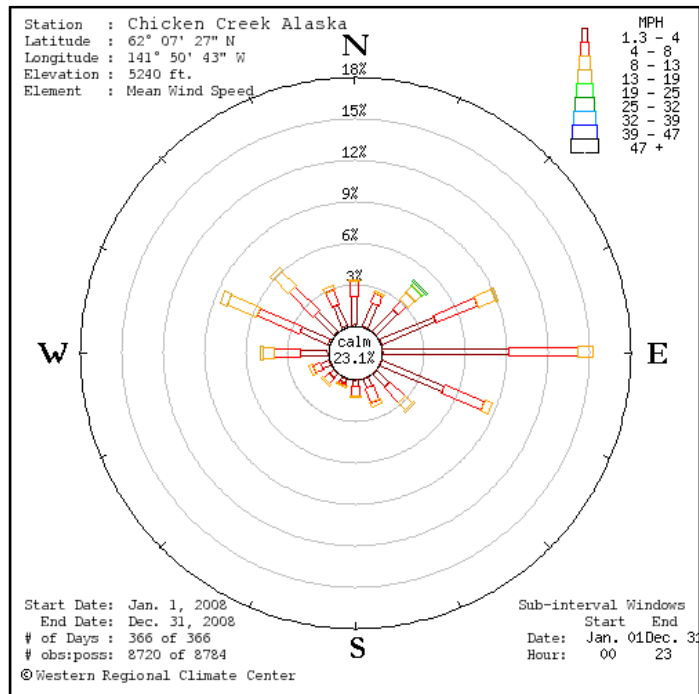
## Tebay Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	89	2	83	13	4	33	-18	31	32	31	83	100	45	41
02/2008	1347	3	74	22	9	37	-18	31	31	31	81	100	52	48
03/2008	5217	1	132	43	19	36	-5	31	31	31	79	100	41	58
04/2008	11239	2	204	16	30	51	3	31	31	31	75	100	28	51
05/2008	15696	2	228	13	40	58	26	32	46	0	69	100	25	18
06/2008	15025	3	248	11	46	66	34	47	57	0	74	100	27	1
07/2008	2715	2	253	9	49	69	-64	50	59	-64	59	100	0	3
08/2008	m	m	m	m	m	m	m	m	m	m	m	m	m	m
09/2008	1980	1	145	7	38	49	21	m	m	m	89	100	50	2
10/2008	2253	2	95	11	26	45	-5	m	m	m	88	100	46	9
11/2008	317	1	69	11	16	34	0	m	m	m	90	100	73	19
12/2008	32	2	50	12	2	32	-27	m	m	m	85	100	62	29



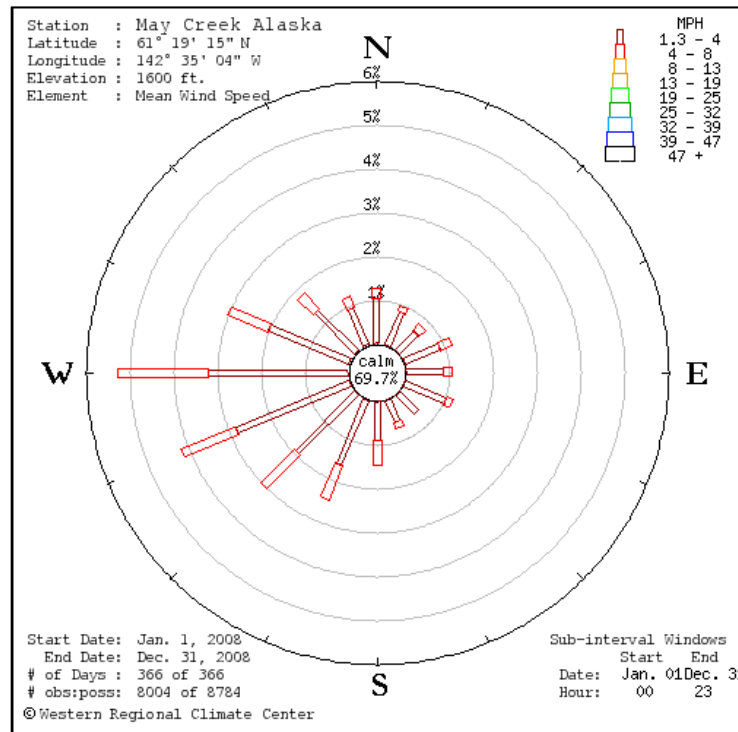
## Chicken Creek Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Average Soil Temperature - 4 Inches			Average Relative Humidity			Snow Depth
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
01/2008	975	4	61	45	7	38	-29	22	24	16	62	96	17	8
02/2008	2214	3	70	33	5	31	-28	14	16	12	65	95	32	1
03/2008	7512	4	55	35	15	36	-16	17	18	16	60	93	31	1
04/2008	12069	4	52	36	25	46	-3	21	27	17	61	100	28	1
05/2008	13752	5	18	27	35	57	22	29	30	27	65	100	25	0
06/2008	12382	5	346	26	42	56	29	32	34	30	71	100	30	0
07/2008	12125	5	322	24	43	62	32	36	37	34	72	100	22	0
08/2008	8227	4	4	20	41	58	32	36	37	35	79	100	33	0
09/2008	5934	4	72	22	36	49	18	34	36	32	67	100	31	0
10/2008	3350	3	77	43	18	39	-6	31	32	31	74	100	39	4
11/2008	1081	3	70	24	14	28	-9	30	31	27	65	96	25	6
12/2008	354	2	68	39	7	32	-24	24	27	20	66	97	9	5



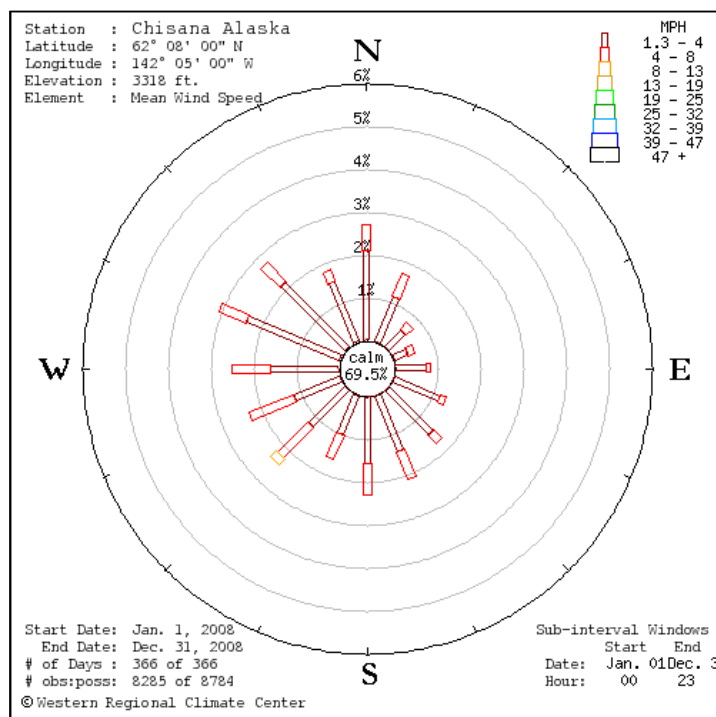
## May Creek Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Snow Depth	Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in	in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Total
01/2008	197	1	101	29	-4	36	-41	4	27	-12	79	98	28	m	0
02/2008	1687	1	197	22	3	47	-46	9	27	-14	74	99	34	m	0
03/2008	6655	2	188	19	22	48	-14	19	32	-5	63	98	21	m	0
04/2008	11142	2	225	22	34	61	-6	34	73	7	61	99	17	m	0
05/2008	15790	2	227	31	46	68	21	50	87	20	53	99	17	m	0.07
06/2008	16267	2	233	21	53	77	27	57	95	26	61	99	16	m	1.05
07/2008	11689	1	218	14	53	80	28	56	99	28	73	99	19	m	3.73
08/2008	9949	1	210	14	51	72	26	53	90	26	80	99	33	m	5.12
09/2008	5073	1	195	18	45	68	20	46	81	20	77	99	30	0	0.83
10/2008	40	0	182	4	-1	18	-21	-1	35	-24	80	87	56	m	0
11/2008	183	0	190	16	7	37	-17	6	38	-19	85	93	60	m	0
12/2008	91	0	191	21	-6	33	-45	2	28	-44	80	94	63	m	0



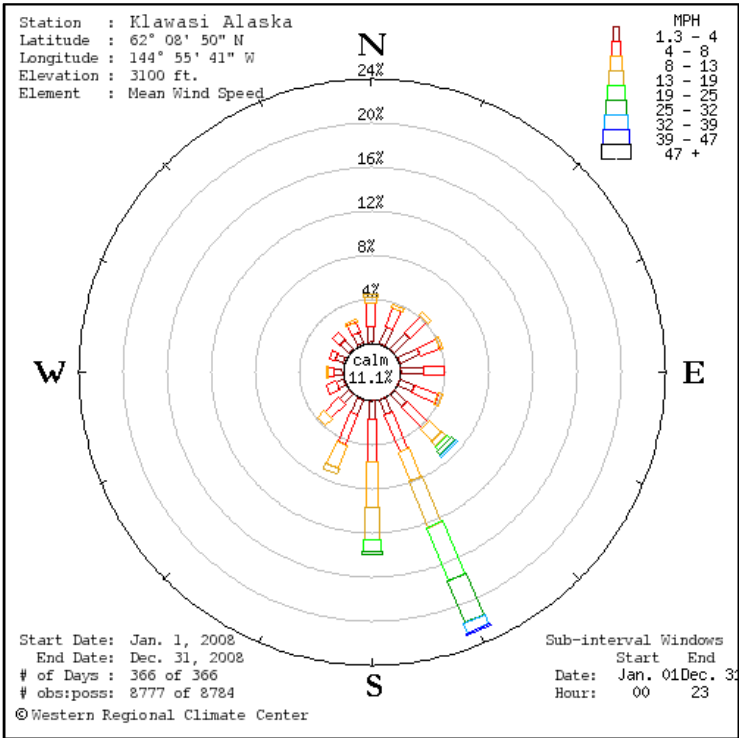
## Chisana Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Snow Depth	Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in	in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Total
01/2008	49	0	143	28	-12	38	-45	-9	31	-37	64	95	33	10	0.00
02/2008	1295	0	123	17	-6	42	-52	-5	28	-40	64	94	25	13	0.00
03/2008	6451	1	127	25	13	50	-26	11	35	-10	57	84	17	14	0.59
04/2008	10301	2	174	22	29	61	-11	28	73	-18	56	100	17	11	0.31
05/2008	14601	2	202	23	42	71	15	45	91	10	56	100	17	0	0.48
06/2008	14112	2	118	27	50	74	23	52	92	20	64	100	19	m	1.96
07/2008	13093	2	160	26	51	78	25	52	94	21	67	100	17	m	2.34
08/2008	11045	1	237	18	47	75	20	47	85	17	78	100	15	4	2.66
09/2008	7049	1	149	22	38	63	11	38	72	7	66	100	22	5	0.20
10/2008	2648	1	202	19	14	50	-28	12	56	-32	67	100	21	4	0.78
11/2008	266	1	345	16	-1	25	-21	-5	30	-28	67	88	49	26	0.00
12/2008	107	0	291	9	-12	21	-47	-9	17	-29	62	95	39	49	0.00



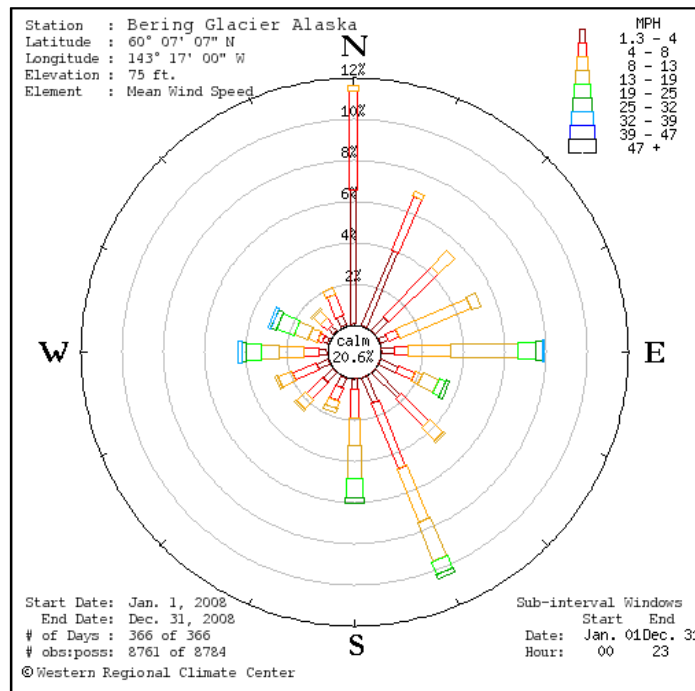
# Klawasi Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Total
01/2008	766	7	129	57	4	42	-25	2	38	-30	57	80	24	0.00
02/2008	1854	7	141	54	6	43	-28	4	43	-35	53	75	28	0.00
03/2008	7180	10	137	59	21	42	-6	20	42	-7	48	81	21	0.00
04/2008	11138	11	145	56	29	54	-3	30	58	-8	54	90	27	0.00
05/2008	16280	10	163	56	41	60	25	43	69	22	47	88	17	0.27
06/2008	15409	8	181	37	48	68	32	50	77	29	56	89	25	1.15
07/2008	12469	10	178	46	50	73	35	50	81	31	67	100	20	3.73
08/2008	10186	7	156	33	48	66	34	48	72	29	75	100	33	3.23
09/2008	6551	11	144	49	42	60	20	41	67	16	68	100	35	1.93
10/2008	3442	8	152	62	22	44	-6	20	43	-10	51	100	0	0.00
11/2008	900	7	134	50	15	35	-6	12	31	-10	27	100	0	0.00
12/2008	308	4	101	43	3	32	-29	-1	29	-35	8	100	0	0.00

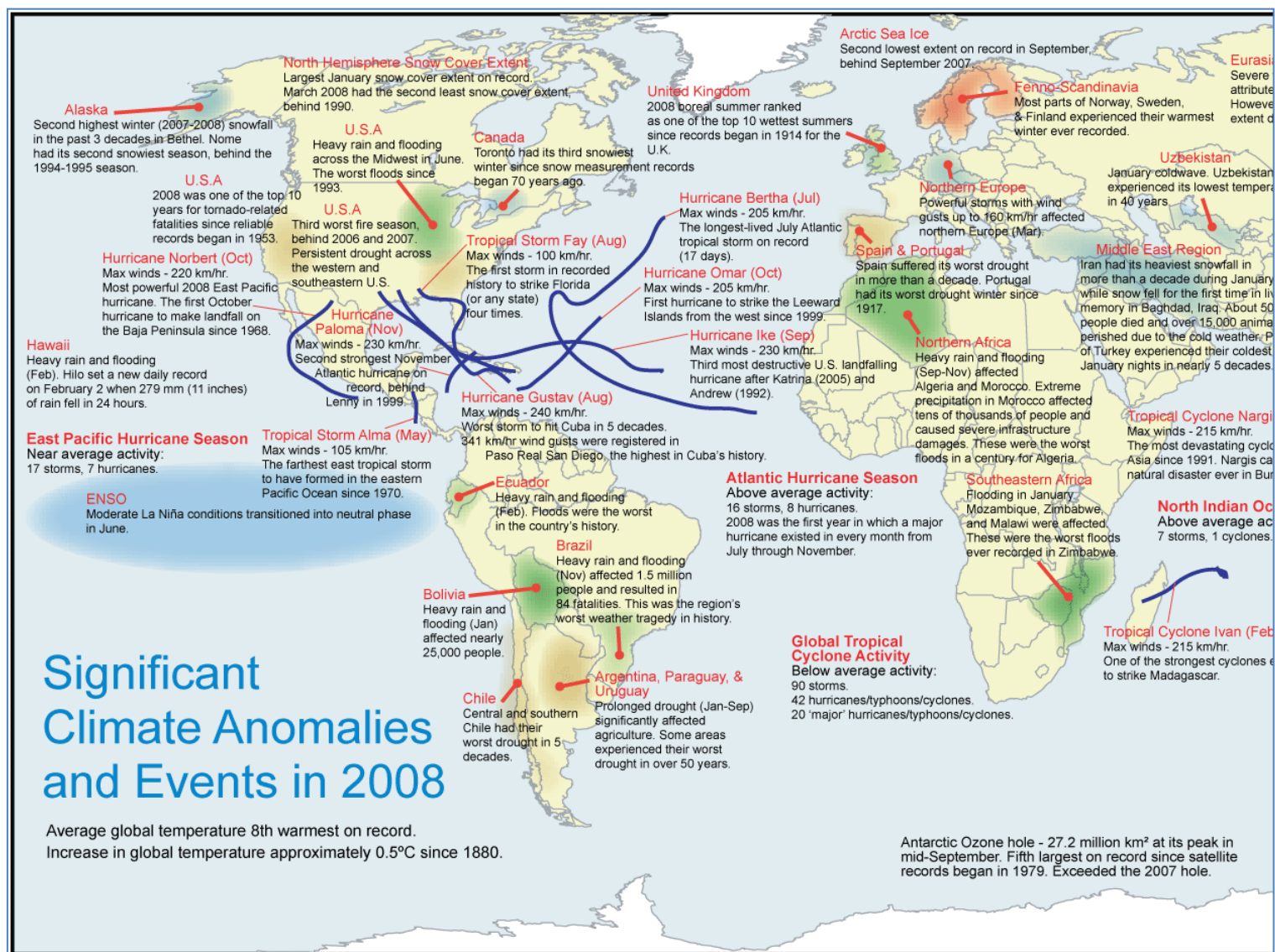


## Bering Glacier Alaska

	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Air Temperature			Ave Fuel Temp			Average Relative Humidity			Precipitation
Date	ly	mph	Deg	mph	Deg F			Deg F			%			in
mm/yyyy	Total	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Total
01/2008	826.1	5	258	189	54	140	-12	m	m	m	86	99	24	0
02/2008	1398	11	250	191	29	46	-3	m	m	m	82	98	27	0
03/2008	4409	9	27	199	35	107	8	m	m	m	80	99	22	0
04/2008	5928	7	35	194	36	57	13	m	m	m	81	98	25	6.74
05/2008	8013	8	38	192	44	63	32	m	m	m	79	97	35	5.98
06/2008	6597	5	31	189	46	63	32	m	m	m	83	98	51	4.95
07/2008	6075	5	27	192	55	140	35	m	m	m	87	97	49	13.06
08/2008	4832	4	40	179	48	63	32	m	m	m	92	100	58	7.59
09/2008	2353	8	161	194	47	60	29	47	68	26	96	100	57	20.42
10/2008	1641	7	151	192	38	55	12	37	59	9	92	100	45	18.87
11/2008	712.5	7	151	189	34	44	17	32	43	7	90	100	46	0
12/2008	555	5	139	181	25	41	-6	23	39	-2	87	100	45	0



## Appendix D: Worldwide significant climate anomalies and events 2008 (NOAA 2009)

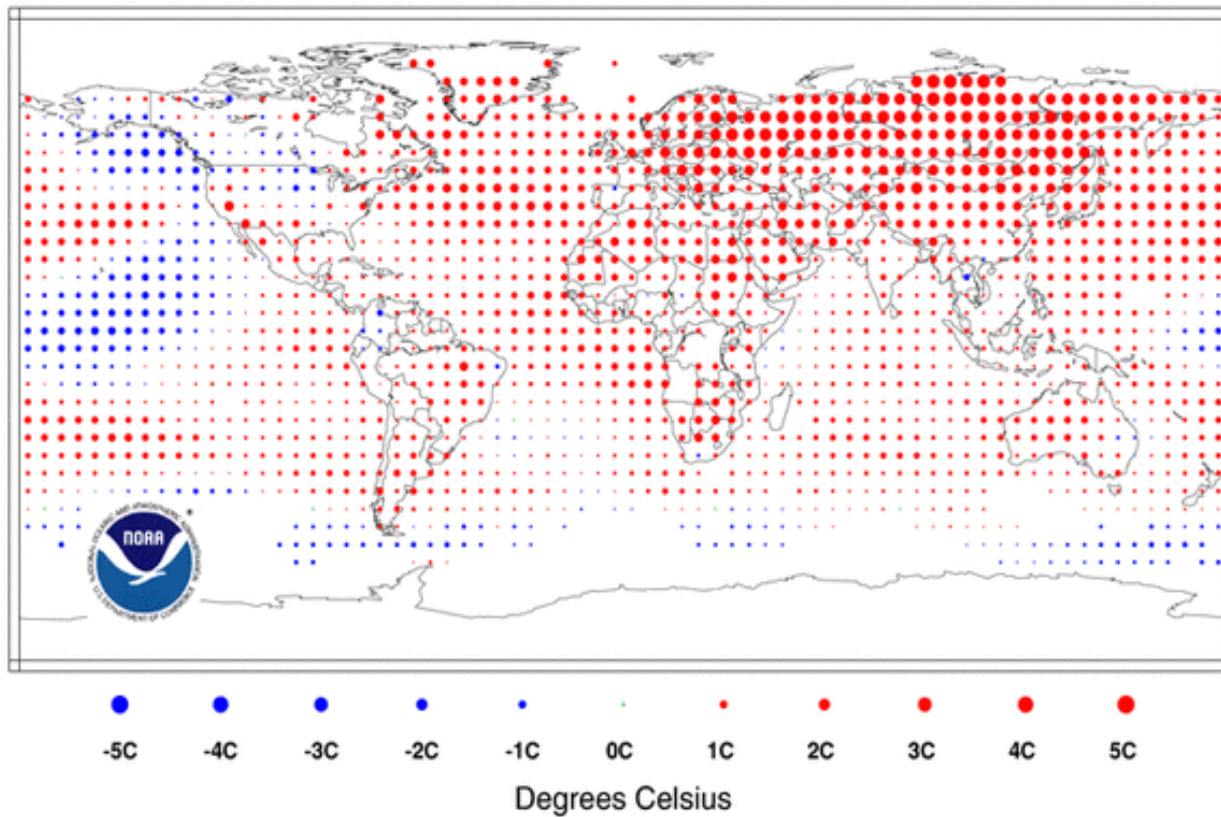




# Temperature Anomalies Jan-Dec 2008

(with respect to a 1961-1990 base period)

National Climatic Data Center/NESDIS/NOAA

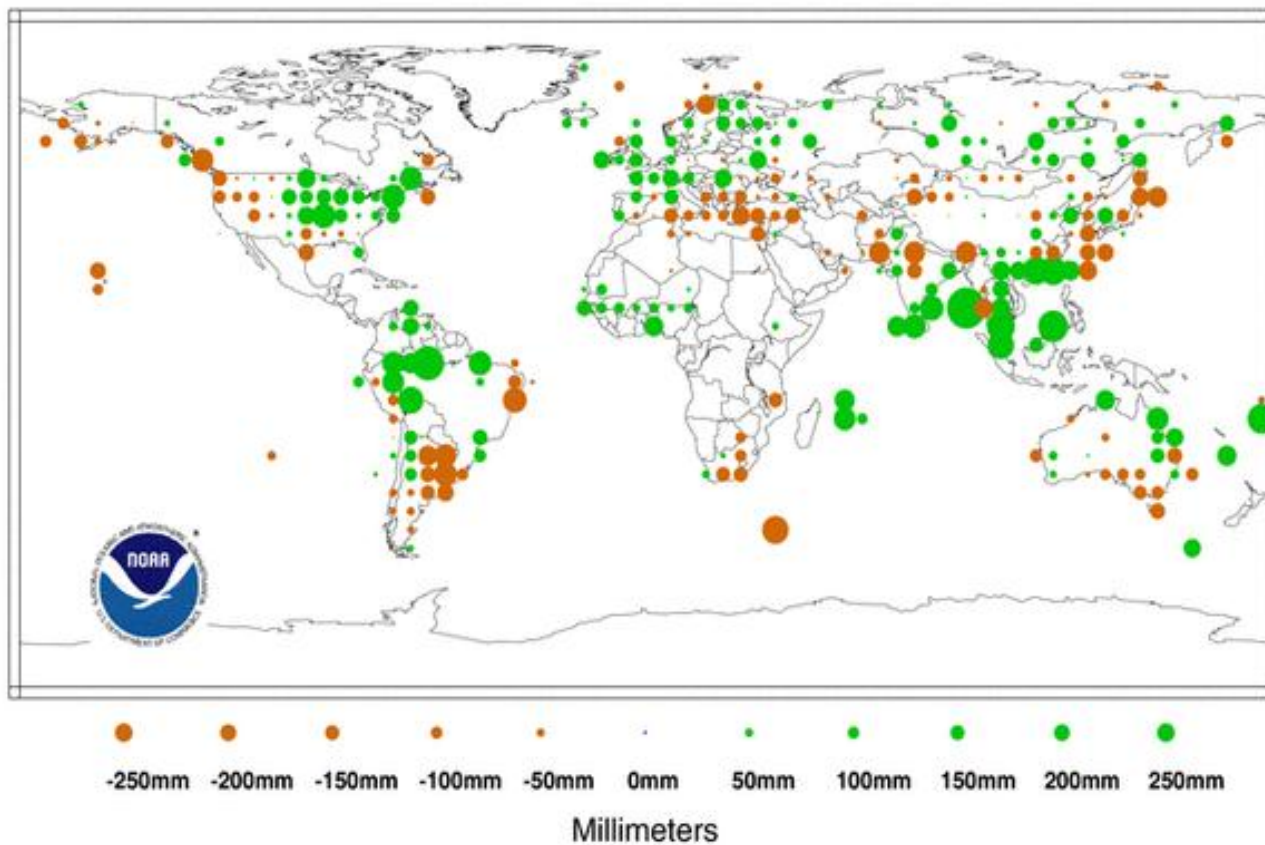


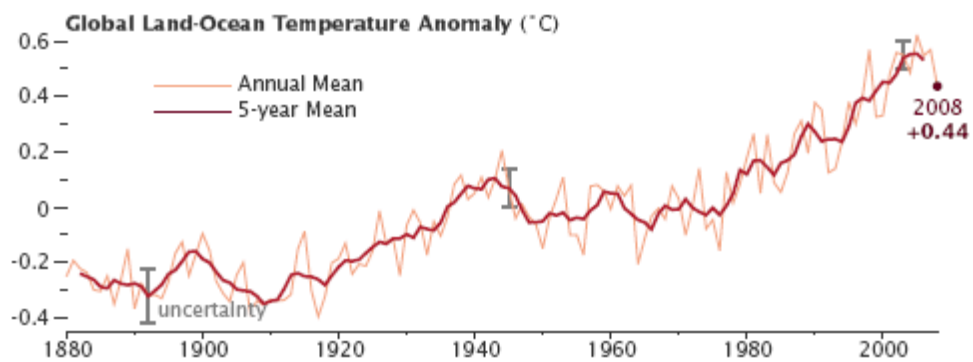
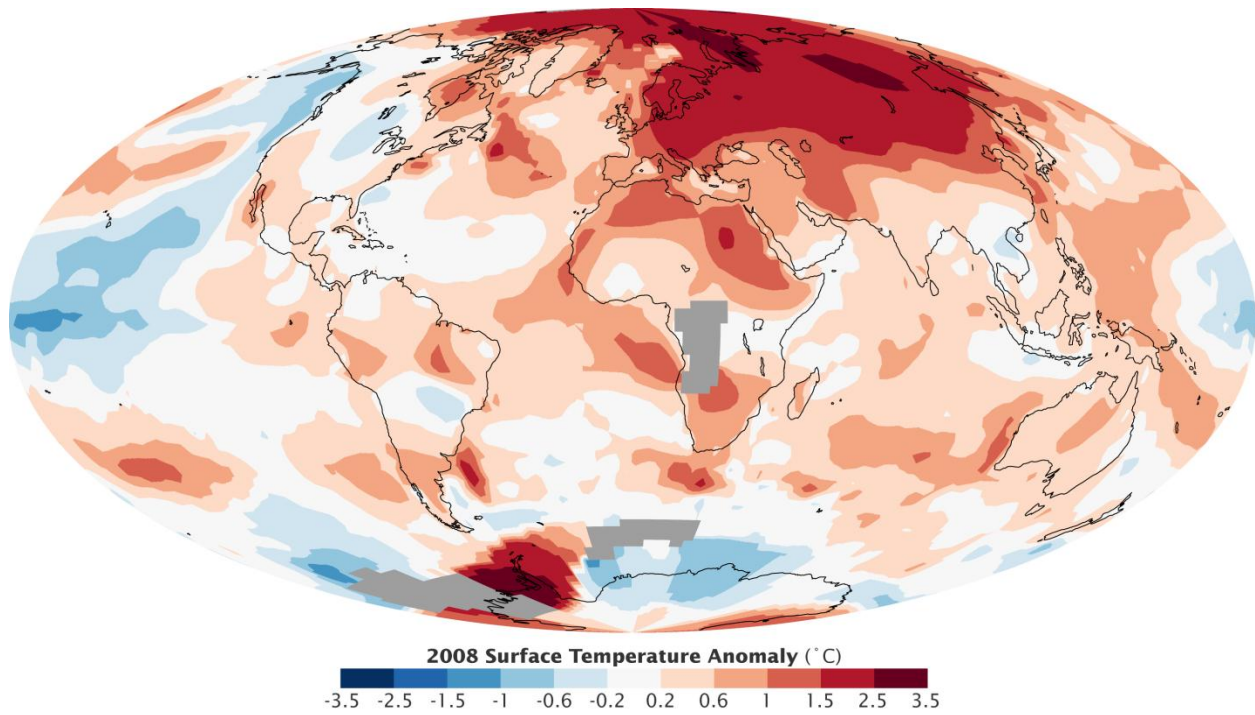


# Precipitation Anomalies Jan-Dec 2008

(with respect to a 1961-1990 base period)

National Climatic Data Center/NESDIS/NOAA





Graphs and figure courtesy of NASA Earth Observatory  
<http://earthobservatory.nasa.gov/IOTD/view.php?id=36699>